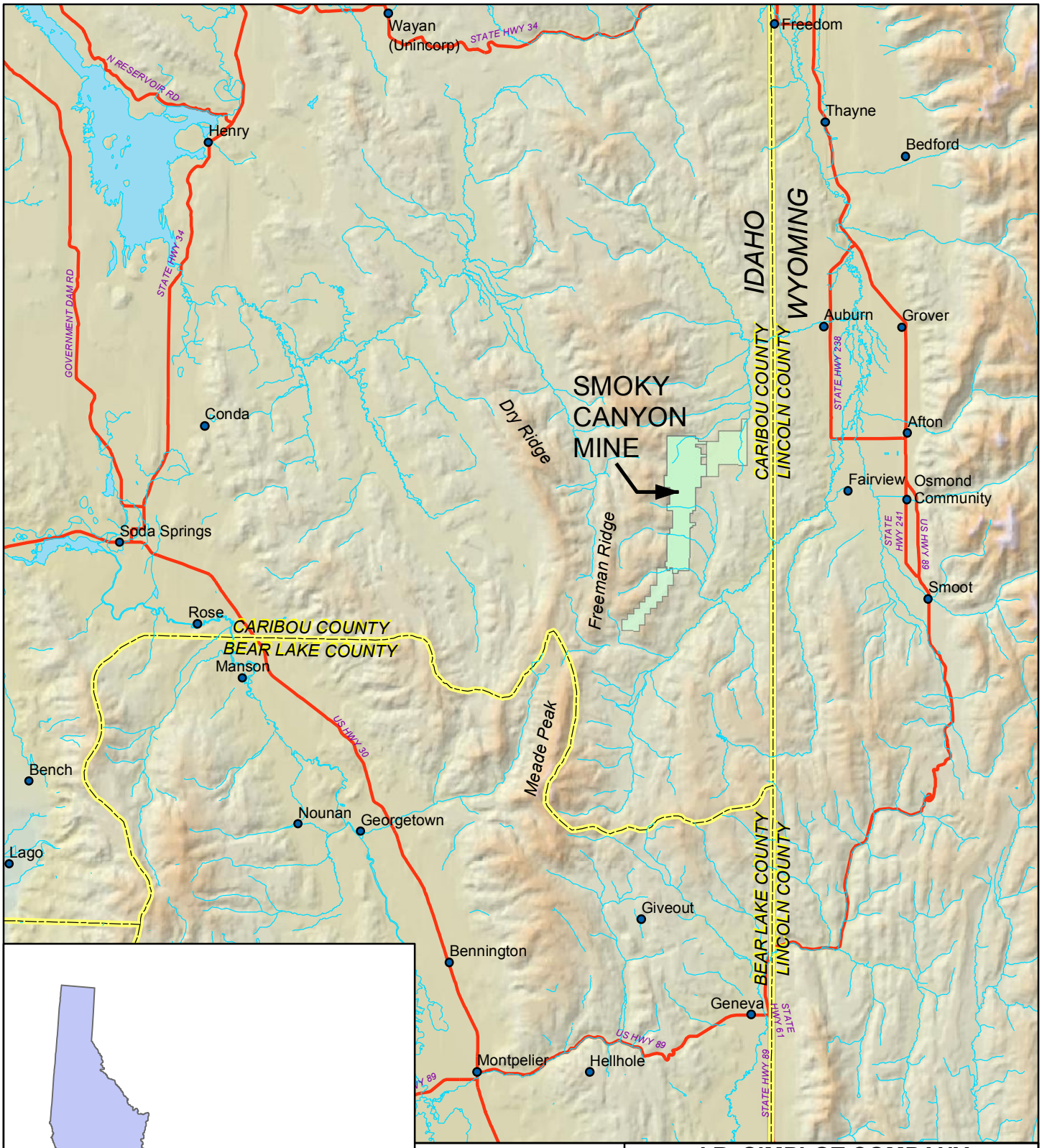

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SMOKY CANYON MINE RI/FS
FEASIBILITY STUDY TECH MEMO #1

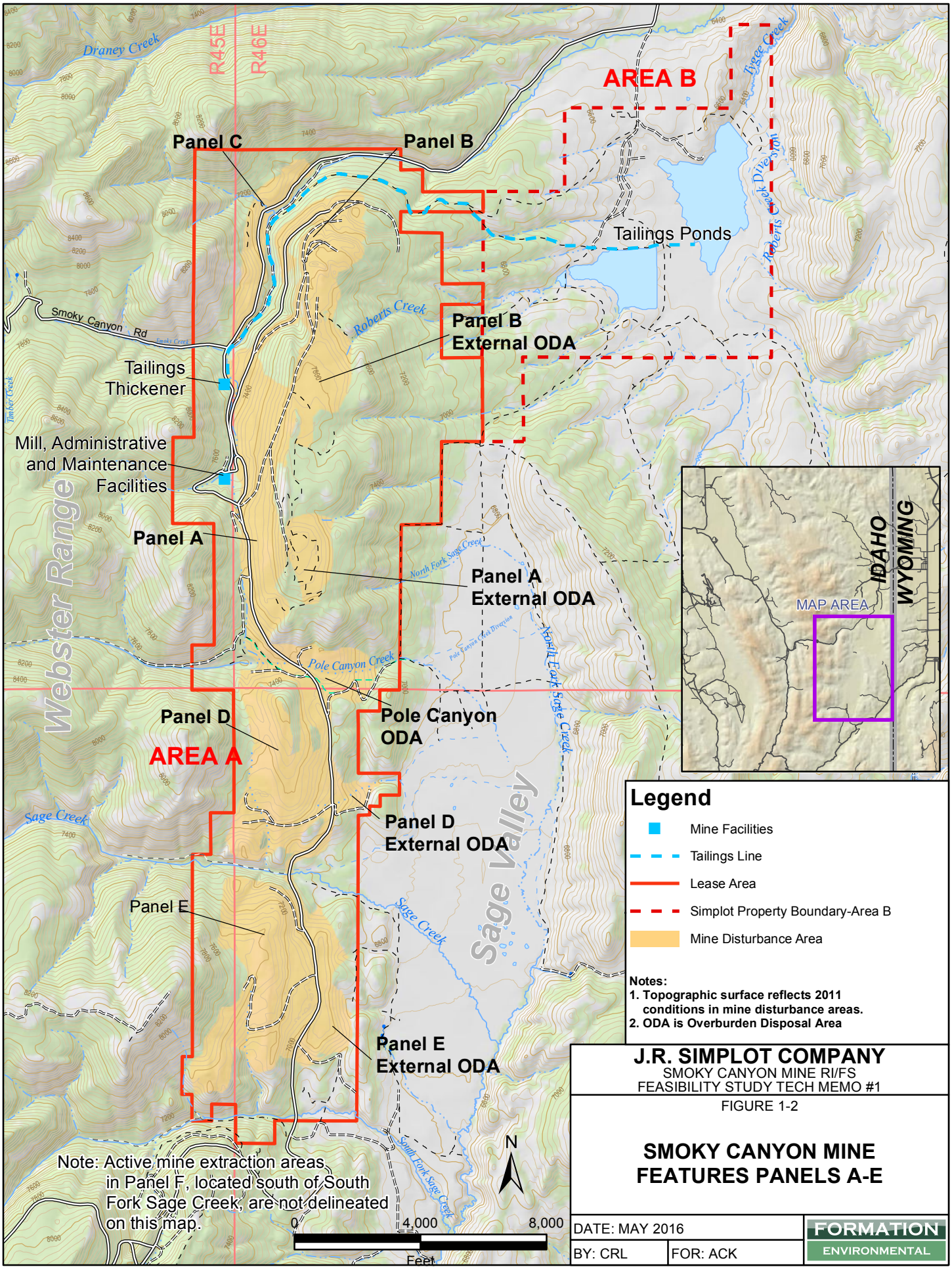
FIGURE 1-1

LOCATION OF THE SMOKY CANYON MINE

DATE: MAY 2016
BY: CRL
FOR: ACK

FORMATION ENVIRONMENTAL

S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig1_1_RgnLoc.mxd


Draney Creek
R45E
R46E
AREA B
Tygee Creek
Panel C
Panel B
Tailings Ponds
Roberts Creek Diversion
Roberts Creek
Smoky Canyon Rd
Panel B
External ODA
Tailings
Thickener
Timber Creek
Mill, Administrative
and Maintenance
Facilities
Webster Range
Panel A
North Fork Sage Creek
Panel A
External ODA
Pole Canyon Creek
Pole Canyon Creek Diversion
North Fork Sage Creek
Pole Canyon
ODA
Panel D
AREA A
Sage Creek
Panel D
External ODA
Sage Valley
Panel E
Sage Creek
Panel E
External ODA
South Fork Sage Creek
IDAHO
WYOMING
MAP AREA
Legend
Mine Facilities
Tailings Line
Lease Area
Simplot Property Boundary-Area B
Mine Disturbance Area
Notes:
1. Topographic surface reflects 2011 conditions in mine disturbance areas.
2. ODA is Overburden Disposal Area
Note: Active mine extraction areas in Panel F, located south of South Fork Sage Creek, are not delineated on this map.
N
0
4,000
8,000
Feet
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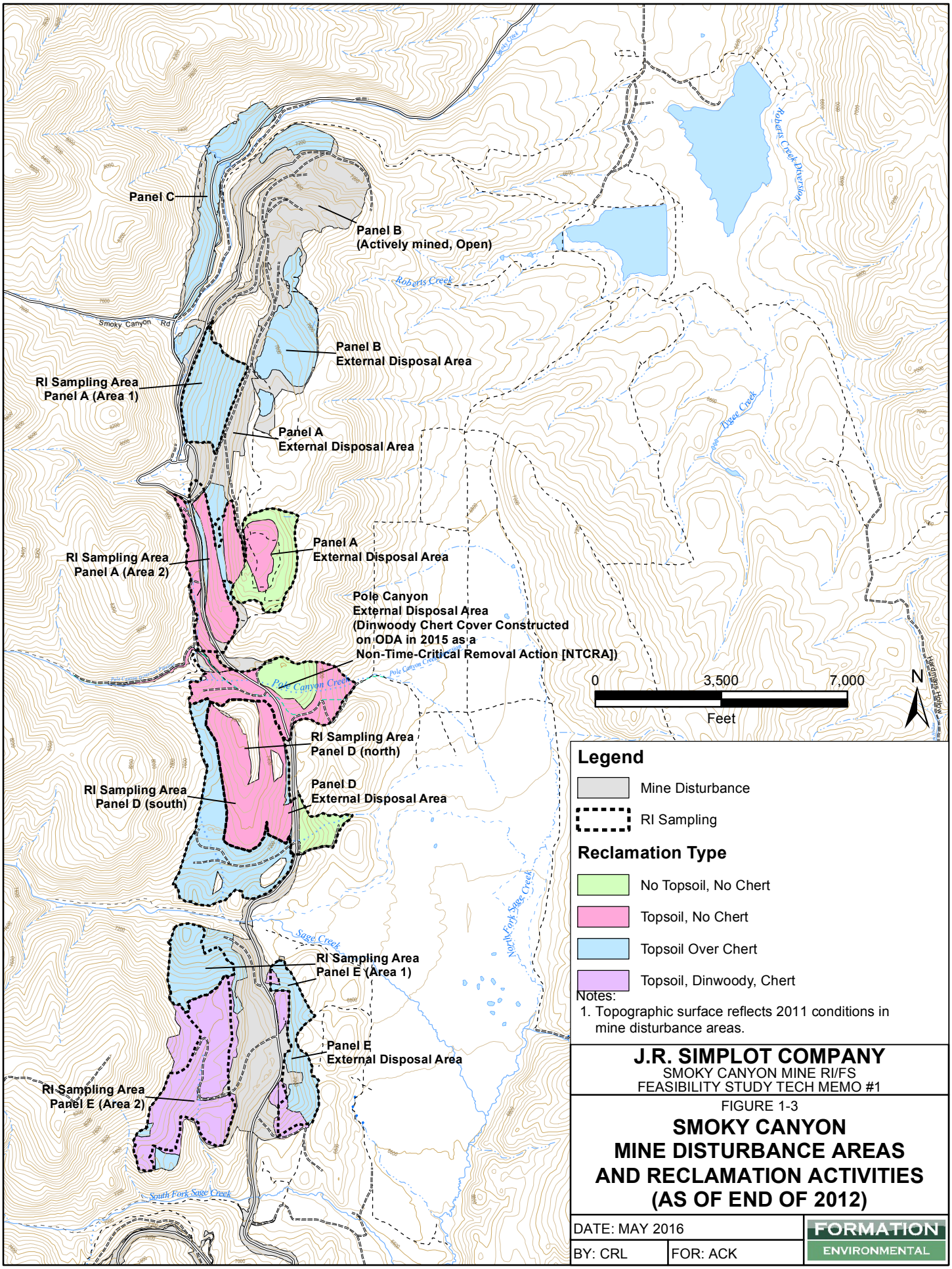
FEASIBILITY STUDY TECH MEMO #1
FIGURE 1-2
SMOKY CANYON MINE
FEATURES PANELS A-E
DATE: MAY 2016
BY: CRL
FOR: ACK
FORMATION
ENVIRONMENTAL
S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig1_2_MineLoc.mxd


Panel C
Panel B
(Actively mined, Open)
Roberts Creek
Smoky Canyon Rd
Panel B
External Disposal Area
RI Sampling Area
Panel A (Area 1)
Panel A
External Disposal Area
Panel A
External Disposal Area
RI Sampling Area
Panel A (Area 2)
Pole Canyon
External Disposal Area
(Dinwoody Chert Cover Constructed
on ODA in 2015 as a
Non-Time-Critical Removal Action [NTCRA])
Pole Canyon Creek
RI Sampling Area
Panel D (north)
RI Sampling Area
Panel D (south)
Panel D
External Disposal Area
Sage Creek
North Fork Sage Creek
RI Sampling Area
Panel E (Area 1)
Panel E
External Disposal Area
RI Sampling Area
Panel E (Area 2)
South Fork Sage Creek
Roberts Creek Diversion
Tygee Creek
0
3,500
7,000
Feet
N
Legend
Mine Disturbance
RI Sampling
Reclamation Type
No Topsoil, No Chert
Topsoil, No Chert
Topsoil Over Chert
Topsoil, Dinwoody, Chert
Notes:
1. Topographic surface reflects 2011 conditions in mine disturbance areas.
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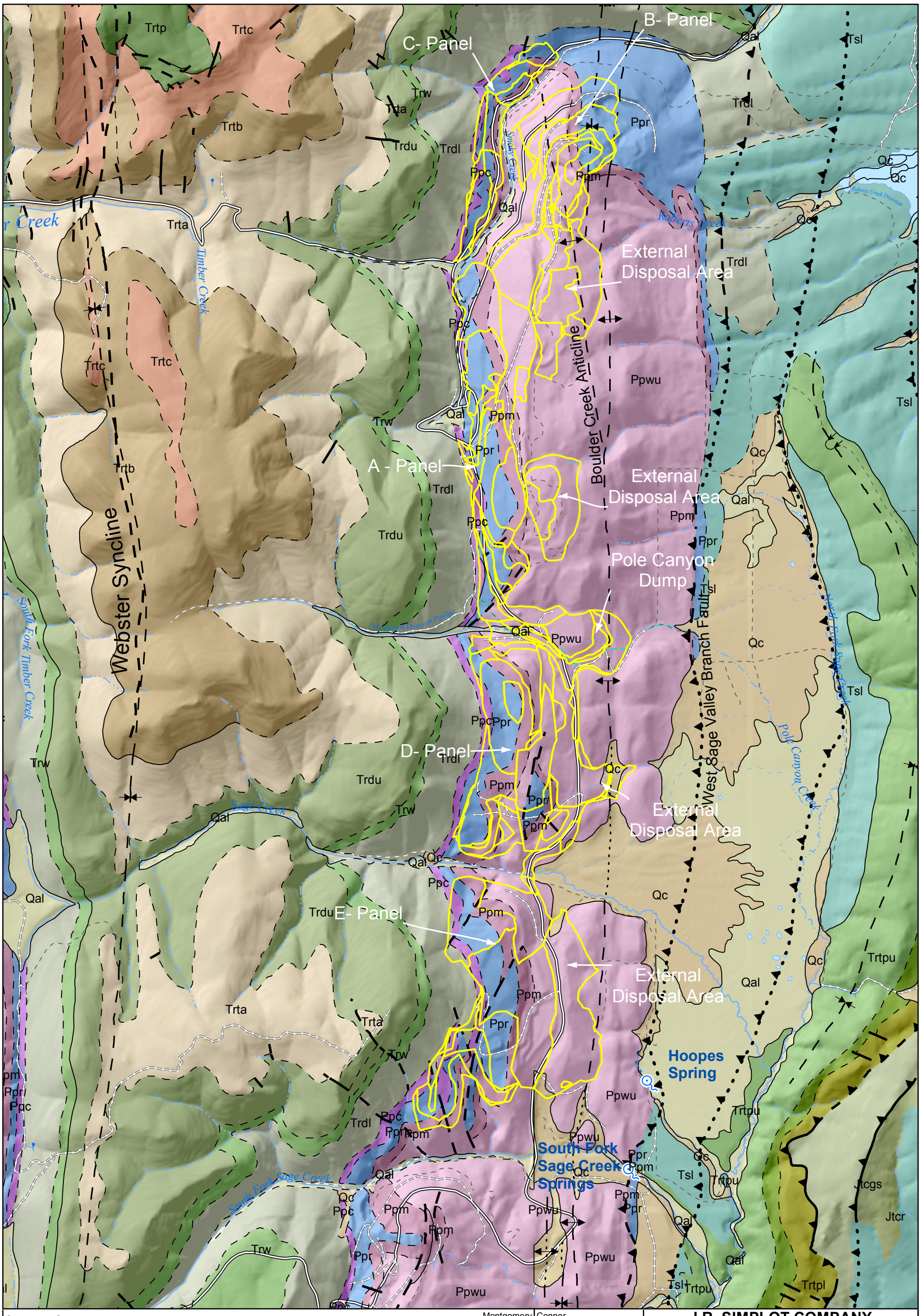
SMOKY CANYON MINE RI/FS
FEASIBILITY STUDY TECH MEMO #1
FIGURE 1-3
SMOKY CANYON
MINE DISTURBANCE AREAS
AND RECLAMATION ACTIVITIES
(AS OF END OF 2012)
DATE: MAY 2016
BY: CRL
FOR: ACK
FORMATION
ENVIRONMENTAL
S:\GIS\arcprj\2010109\plt\FS\TechMemo1\Fig1_03_MineDis2012.mxd



Legend

Geologic Features

- Contact (Dashed where inferred, dotted where buried)
- Normal Fault (Dashed where inferred, dotted where buried)
- Thrust Fault (Dashed where inferred, dotted where buried)
- Syncline Axis
- Anticline Axis

Hydrology

- Perennial Stream
- Intermittent Stream

Mine Features

- Areas of Mine Disturbance

Montgomery & Cheney (1967) | Conner (1980)

See Figure 2.3-2 for Explanation of Geologic Map Units.

0 1,500 3,000

Feet

N

Geology:
Geology of the Sage Valley Quadrangle, Idaho-Wyoming. John L. Conner, BYU, 1980
Geology of the Stewart Flat Quadrangle, Caribou County, Idaho. Kathleen M. Montgomery and T. M. Cheney, USGS, 1967

Topography:
2011 aerial survey (shown as hillshade).

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FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-1

GEOLOGIC MAP OF SMOKY CANYON MINE AND VICINITY

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BY: CRL | FOR: ACK

FORMATION ENVIRONMENTAL

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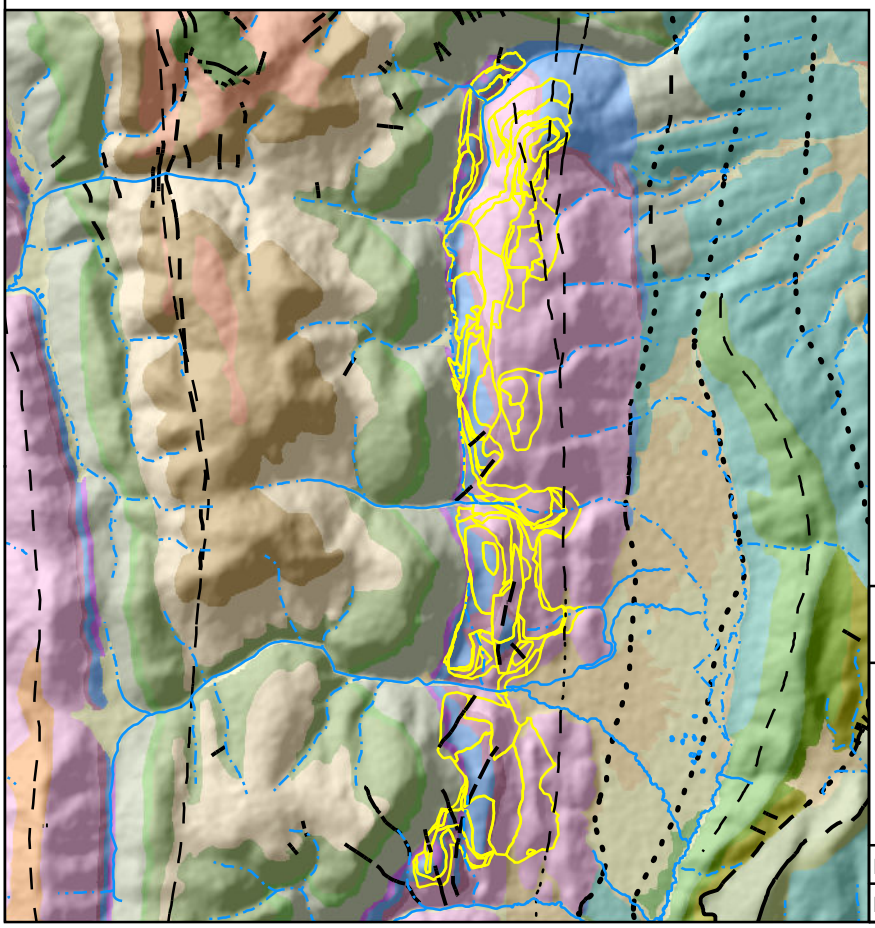
EXPLANATION FOR GEOLOGIC MAP

Geologic Map Units and Symbols

Age	Formation	Map Symbol	Description
Quaternary		Qt	Travertine
		Qc	Colluvium
		Qal	Alluvium
Tertiary	Salt Lake	Tsl	Salt Lake Formation
	Unconformity		
Jurassic	Nugget Sandstone	Jn	Nugget Sandstone
Triassic	Thaynes	Trtpu	Upper Portneuf Limestone Member
		Tral	Ankareh Formation - Lane Tongue
		Trtpl	Lower Portenuf Limestone Member
		Trtc	Thaynes C Member
		Trtb	Thaynes B Member
		Trta	Thaynes A Member
	Dinwoody	Trdu	Upper Dinwoody Formation
	Woodside	Trw	Woodside Formation
	Dinwoody	Trdl	Lower Dinwoody Formation
Permian	Phosphoria	Ppc	Cherty Shale Member
		Ppr	Rex Chert Member
		Ppm	Meade Peak Member
Pennsylvanian/Permian	Park City & Wells	Ppwu	Grandeur Member of Park City Formation and Upper Wells Formation
	Wells	Ppwl	Lower Wells Formation



Geologic Map Symbols

Contact (Dashed where inferred, dotted where buried)

Normal Fault (Dashed where inferred, dotted where buried)

Thrust Fault (Dashed where inferred, dotted where buried)

Syncline Axis

Anticline Axis

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FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-2

EXPLANATION FOR GEOLOGIC MAP

DATE: MAY 2016

BY: CRL | FOR: ACK

FORMATION ENVIRONMENTAL

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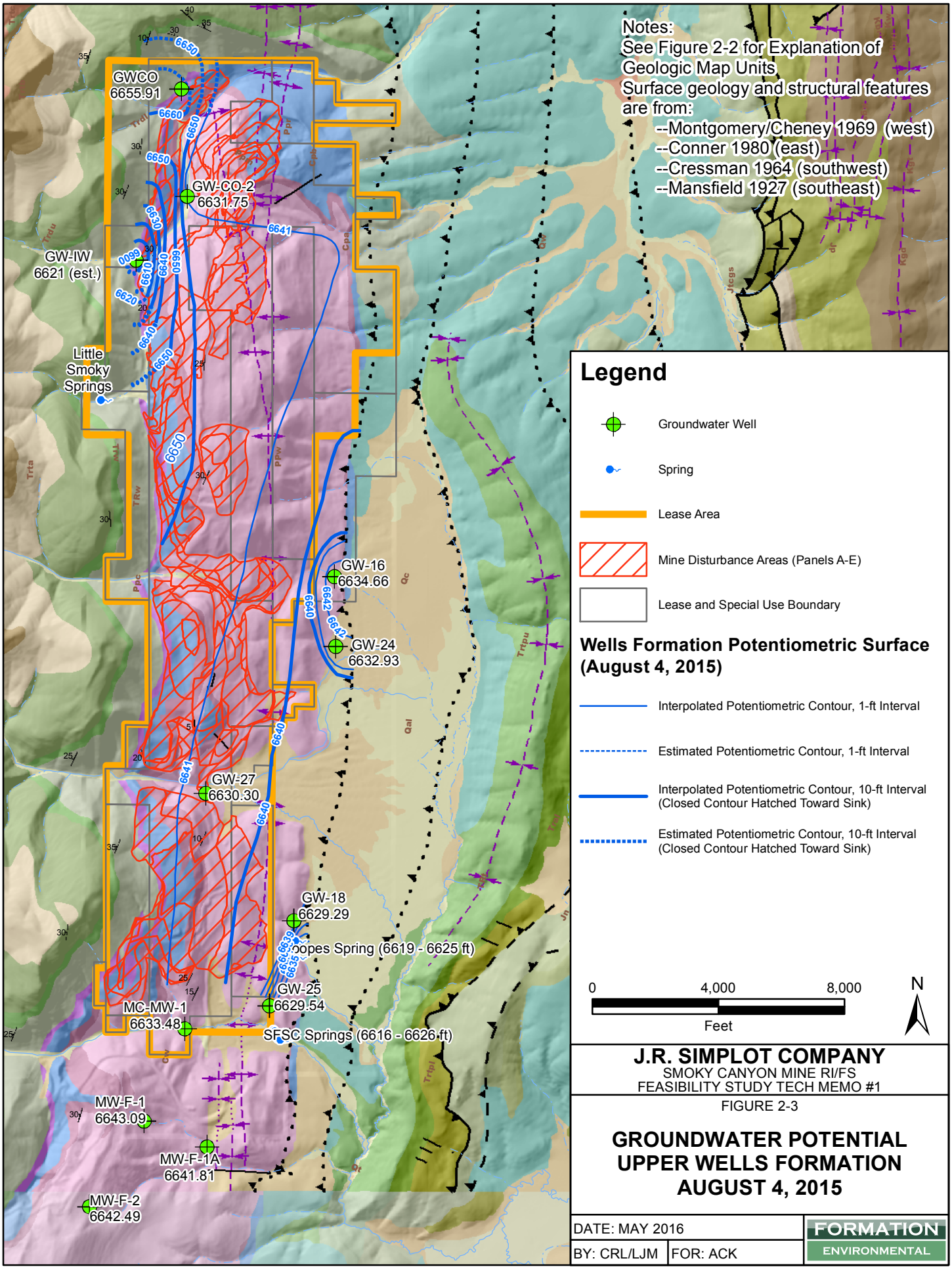

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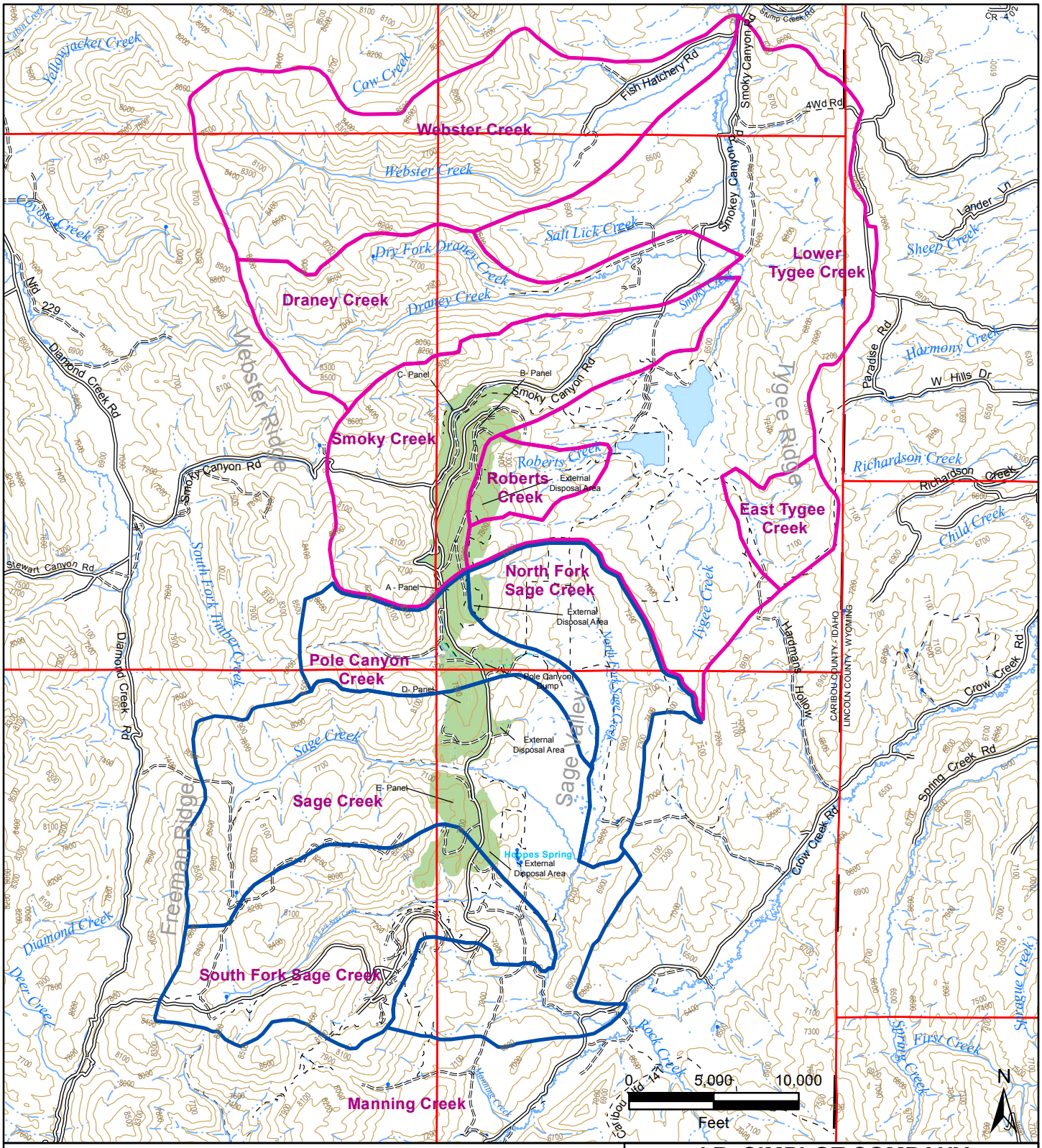
FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-3

GROUNDWATER POTENTIAL UPPER WELLS FORMATION AUGUST 4, 2015

DATE: MAY 2016	FORMATION ENVIRONMENTAL
BY: CRL/LJM	FOR: ACK

S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig2_03_PotSurf_2015-08.mxd



Legend

- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Pipeline
- Historic Flow Path
- Canal Ditch
- Intemittent Stream
- Perennial Stream
- Lake/Pond
- Mine Disturbance

Watershed Features

- Sage Creek Basin (Drains to Crow Creek)
- Tygee Creek Basin (Drains to Stump Creek)

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SMOKY CANYON MINE RI/FS
FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-4

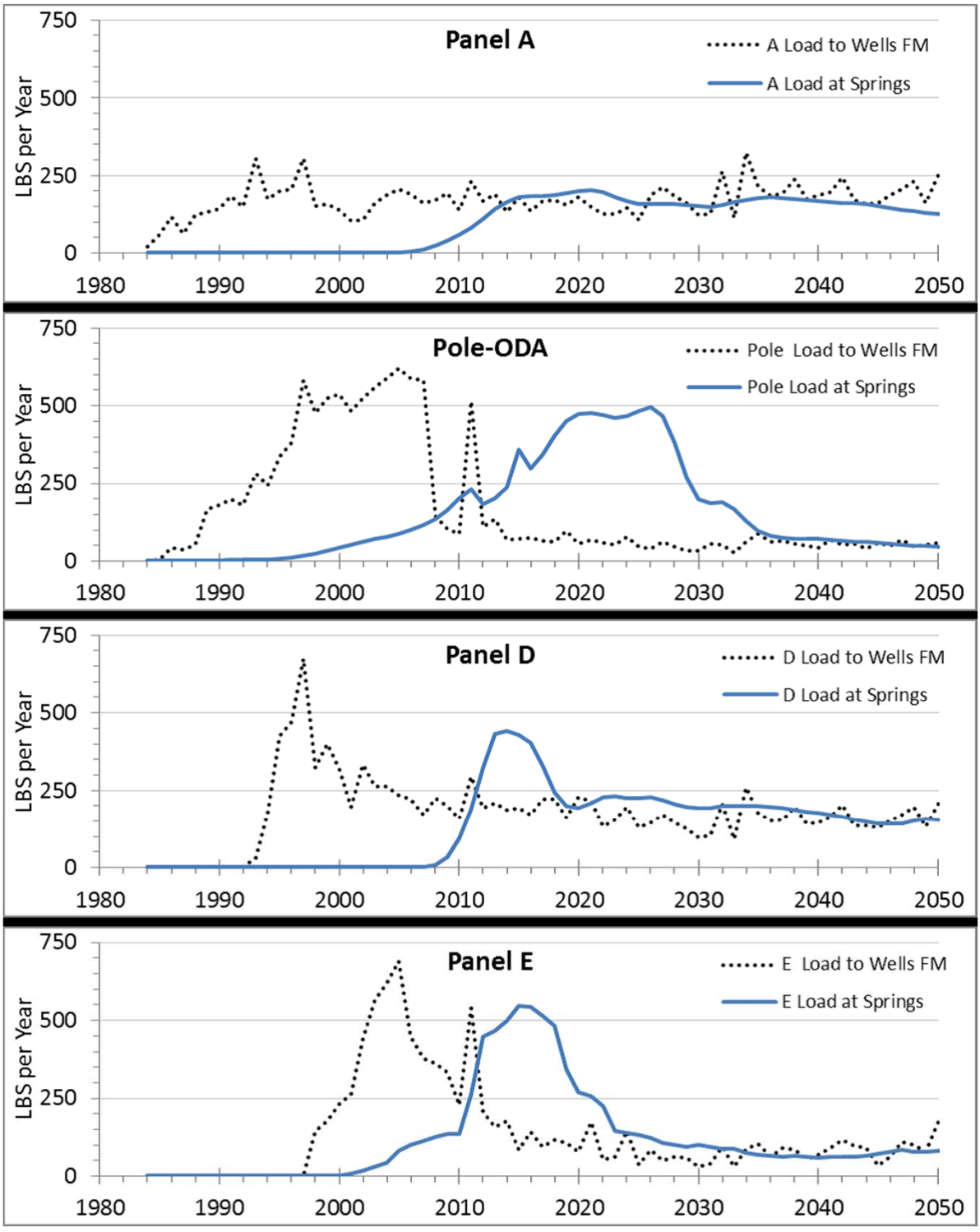
SMOKY CANYON MINE AND VICINITY HYDROLOGIC FEATURES

DATE: MAY 2016
BY: CRL
FOR: ACK

FORMATION ENVIRONMENTAL

S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig2_4_wshed.mxd

S:\Jobs\0442-004-900-Simplot-Smoky\RIFS\FeasibilityStudy\FSTM1\Figures\Fig2-5_SeMassLoad.pptx



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SMOKY CANYON MINE RI/FS
FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-5

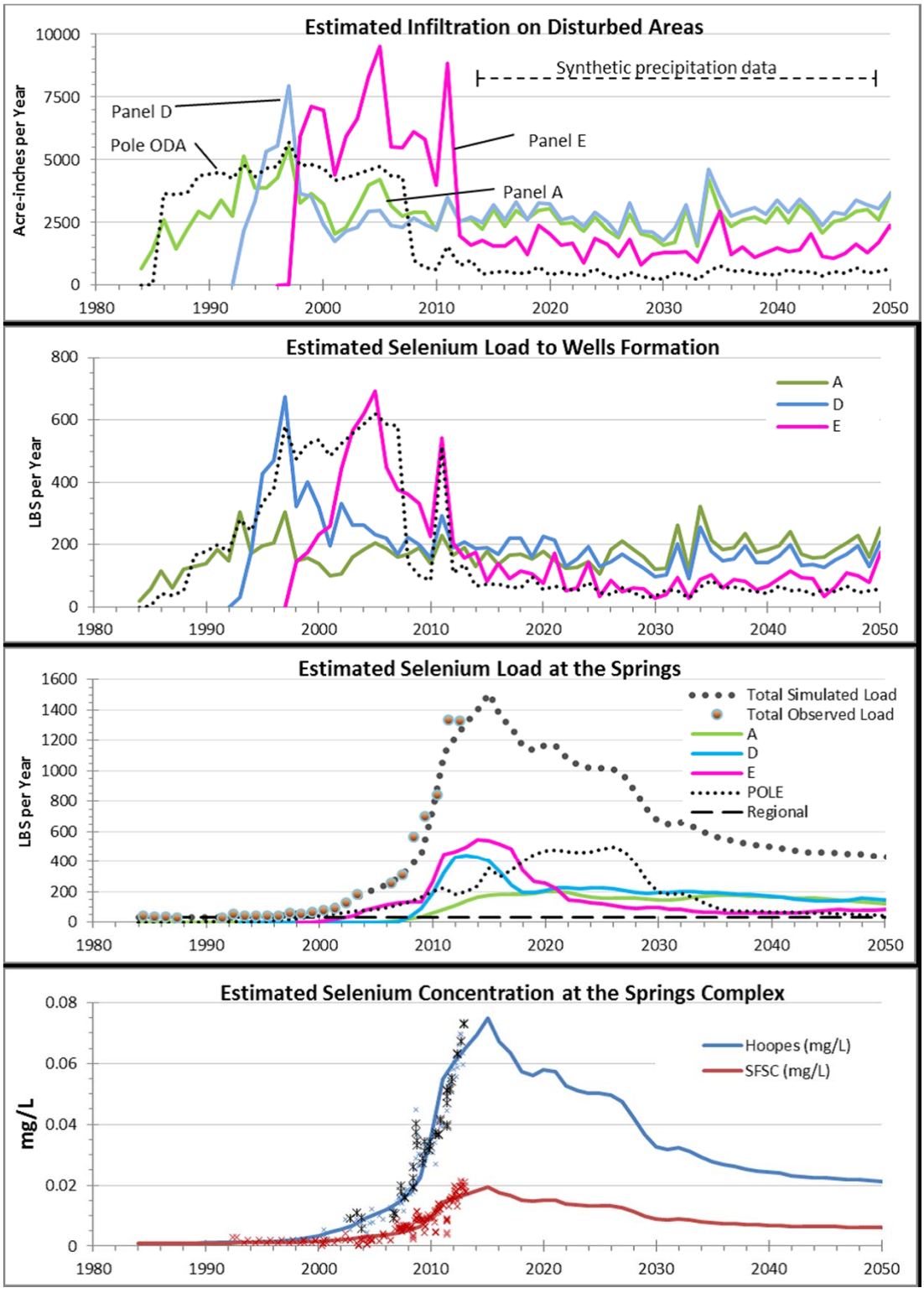
ESTIMATED SELENIUM MASS LOAD TO THE WELLS FORMATION AND ARRIVAL AT SPRINGS COMPLEX FOR EACH SOURCE AREA

DATE: APRIL 2016

BY: PHT FOR: ACK

FORMATION ENVIRONMENTAL

S:\Jobs\0442-004-900-Simplot-Smoky\RIFS\FeasibilityStudy\FSTM1\Figures\Fig2-6_EstInfiltration.pptx



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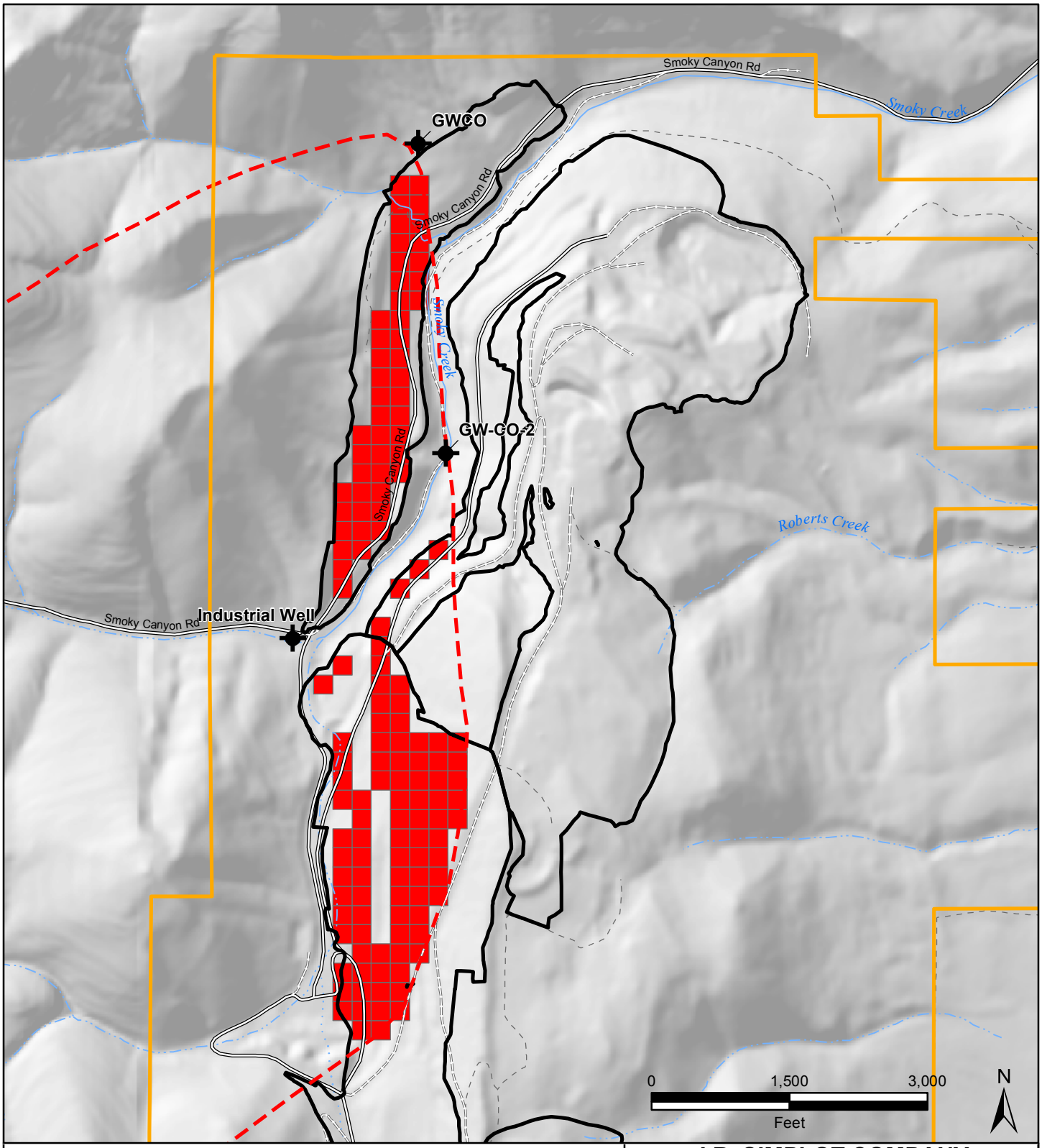
FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-6
ESTIMATED INFILTRATION ON DISTURBERD AREAS, ESTIMATED SELENIUM LOADING TO WELLS FORMATION AND SPRINGS COMPLEX

DATE: APRIL 2016	FORMATION ENVIRONMENTAL
BY: PHT FOR: ACK	



Legend

- Groundwater Monitoring Locations
- Minor Road
- Unimproved Road
- Trail (4WD)
- Historic Flow Path
- Intermittent Stream
- Perennial Stream
- Lease Area
- Structural Influence
- Approximate Mine Panel Boundaries
- Backfilled Areas (Source Cells) v2

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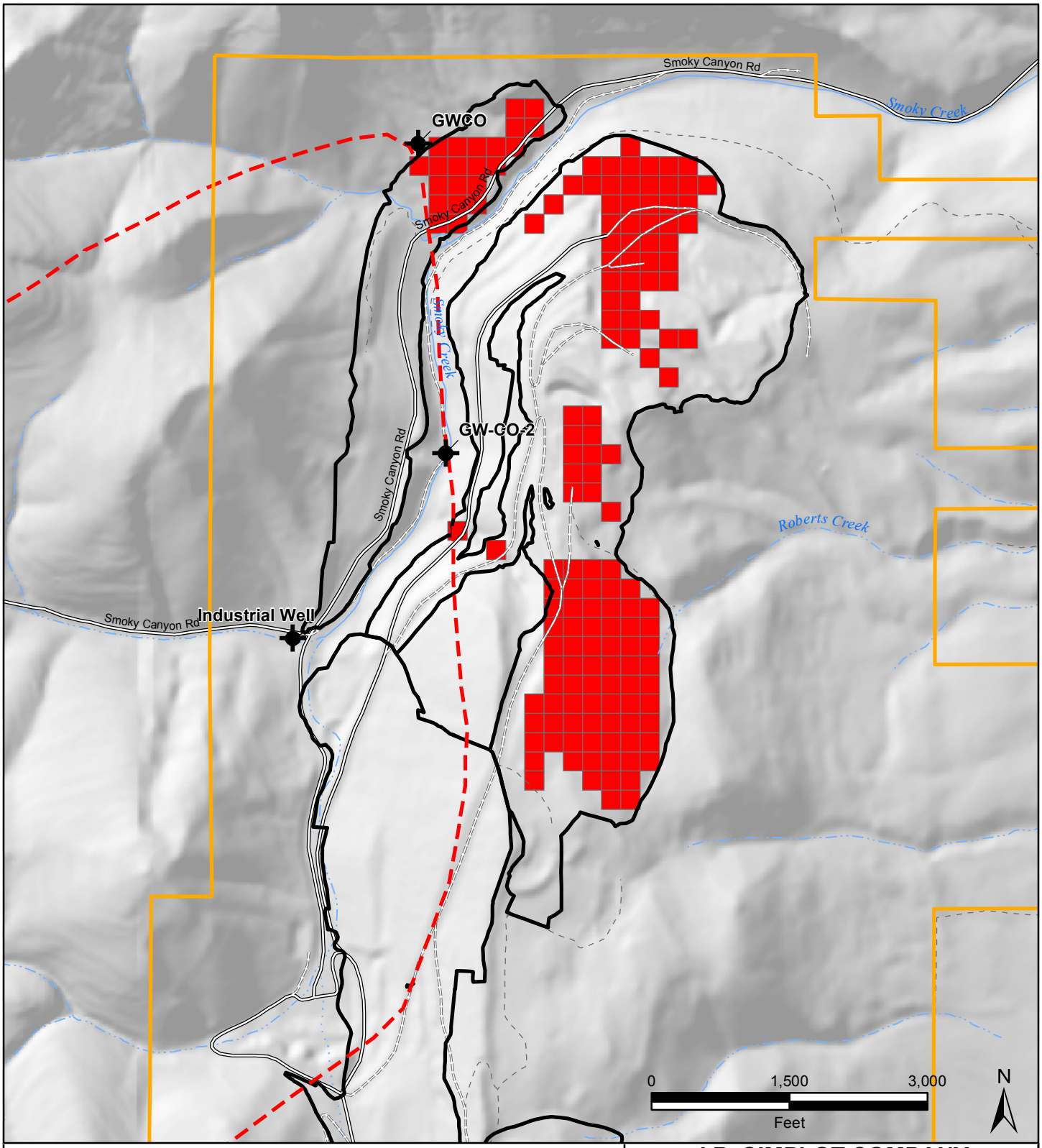
FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-7

MODEL GRID CELLS REPRESENTING AREAS OF SELENIFEROUS BACKFILL (2012 CONDITIONS) INSIDE ASSUMED GW-IW CAPTURE ZONE

DATE: MAY 12, 2016		FORMATION ENVIRONMENTAL
BY:	FOR:	

S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig2_07_ModelGrid_v2_inside.mxd



Legend

- Groundwater Monitoring Locations
- Minor Road
- Unimproved Road
- Trail (4WD)
- Historic Flow Path
- Intemittent Stream
- Perennial Stream
- Lease Area
- Structural Influence
- Approximate Mine Panel Boundaries
- Backfilled Areas (Source Cells) v2

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FEASIBILITY STUDY TECH MEMO #1

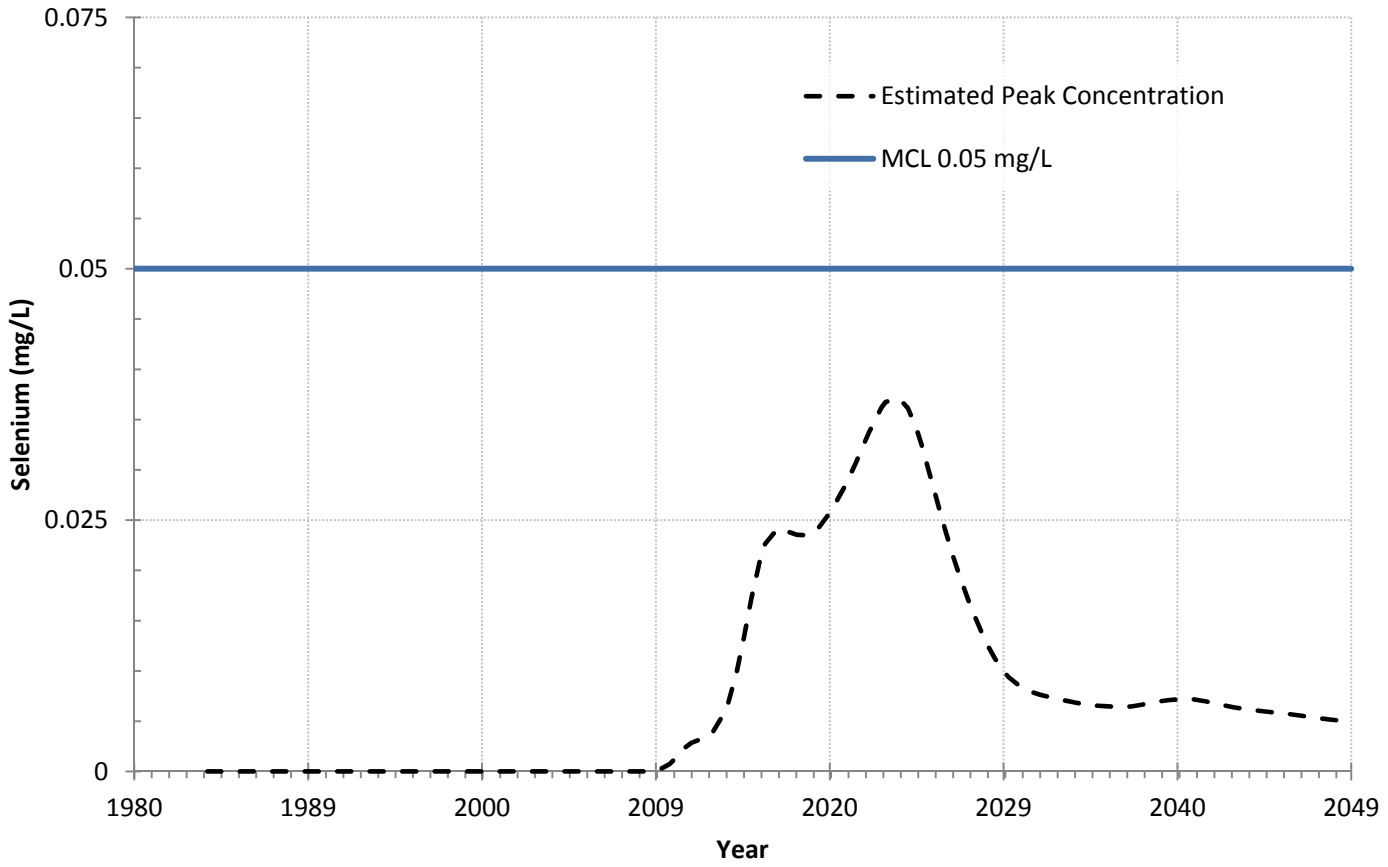
FIGURE 2-8

MODEL GRID CELLS REPRESENTING AREAS OF SELENIFEROUS BACKFILL (2012 CONDITIONS) OUTSIDE ASSUMED GW-IW CAPTURE ZONE

DATE: MAY 12, 2016	FORMATION ENVIRONMENTAL
BY:	FOR:

S:\GIS\arcprj\2010109\plt\FS\TechMemo1\Fig2_08_ModelGrid_v2.mxd

S:\Jobs\0442-004-900-Simplot-Smoky\RIFS\FeasibilityStudy\FSTM1\Fig2-9_SeConcNorthLeaseBndry.ppt



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FEASIBILITY STUDY TECH MEMO #1

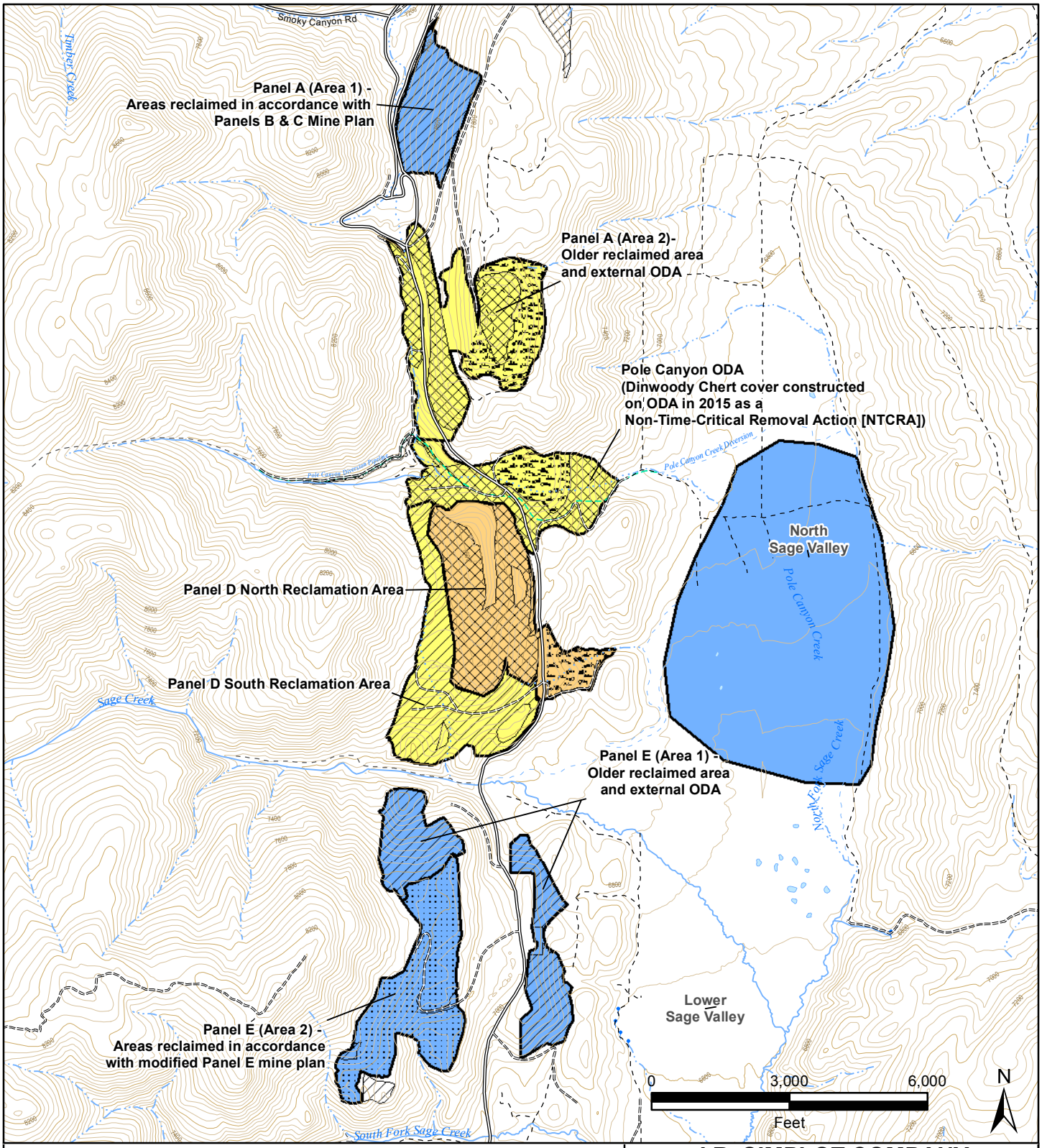
FIGURE 2-9

POTENTIAL SELENIUM CONCENTRATION IN GROUNDWATER AT THE NORTHERN LEASE BOUNDARY

DATE: MAY 2016
BY: PHT
FOR: ACK

FORMATION ENVIRONMENTAL

S:\JOBS\0442-004-900-SIMPLOT-SMOKY\RIFS\RI_REPORT\REVDRAFT\FIGS\APPH\FIGH_5-37_PREDCONCENTRATION.PPTX



Legend

Cover Type

- TOPSOIL DINWOODY CHERT
- NO TOPSOIL NO CHERT
- TOPSOIL OVER CHERT
- TOPSOIL NO CHERT

Selenium Risk

- Lowest Risk
- Moderate - High Risk
- Highest Risk

- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Index Contour (200 ft)
- Intermediate Contour (40 ft)

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FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-10

SUMMARY OF SELENIUM RISK TO TERRESTRIAL BIOTA

DATE: MAY 2016	FORMATION ENVIRONMENTAL
BY: CRL	FOR: ACK

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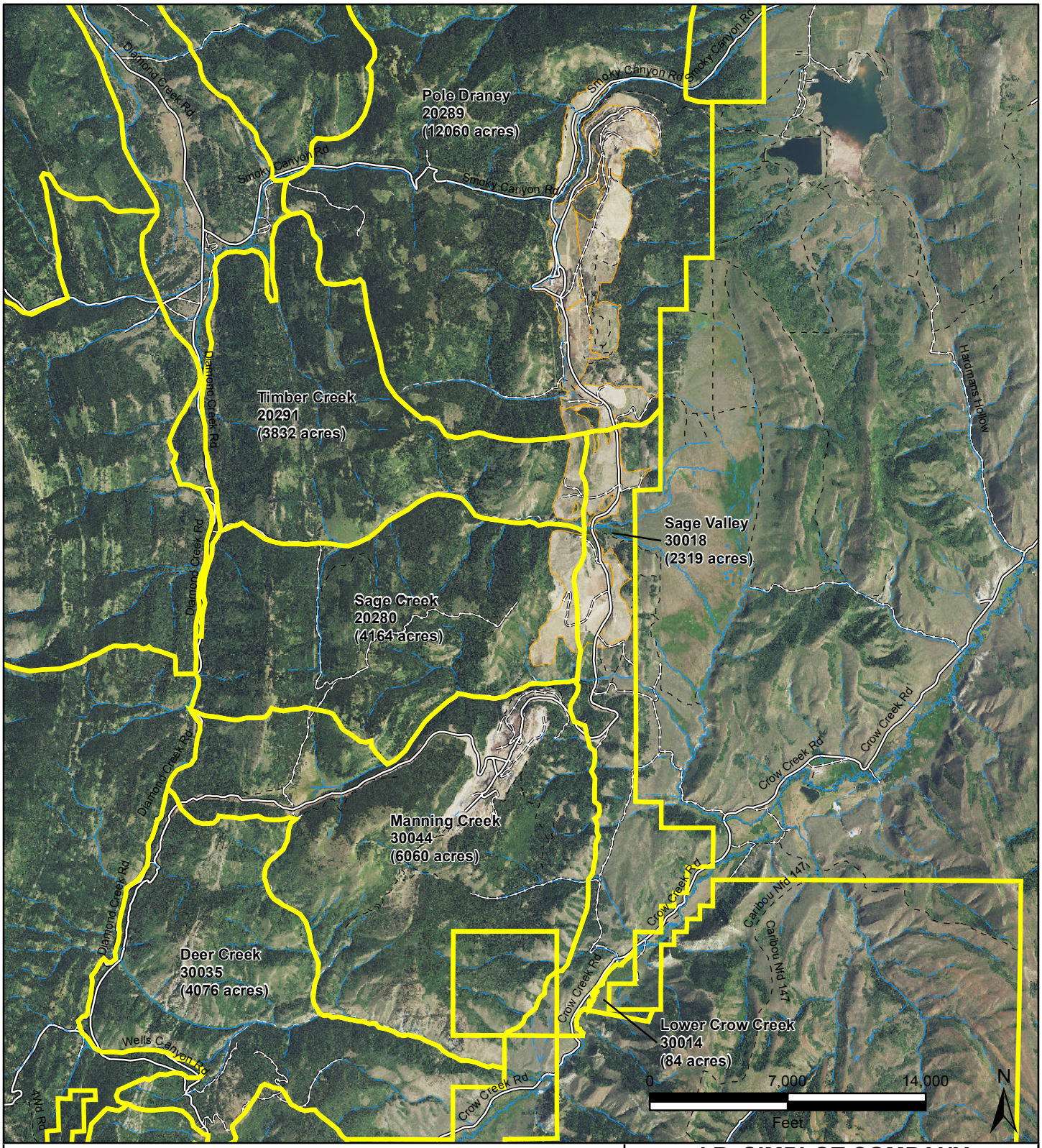

Legend

- Grazing Allotment (USFS)
- Mine Disturbance Area (Panels A-E)
- Perennial Stream
- Intermittent Stream

Allotments in vicinity of Smoky Canyon Mine are labeled.
Source: U.S. Forest Service (USFS). 2008. Range allotments shapefile - in Geographic Information System (GIS) coverages provided by Caribou National Forest, via e-mail. April 2008.
Aerial Source: 2013 NAIP photo from USDA

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FEASIBILITY STUDY TECH MEMO #1

FIGURE 2-11

USFS GRAZING ALLOTMENTS - WITH SATELLITE IMAGERY

DATE: MAY 2016		FORMATION ENVIRONMENTAL
BY: CRL	FOR: ACK	

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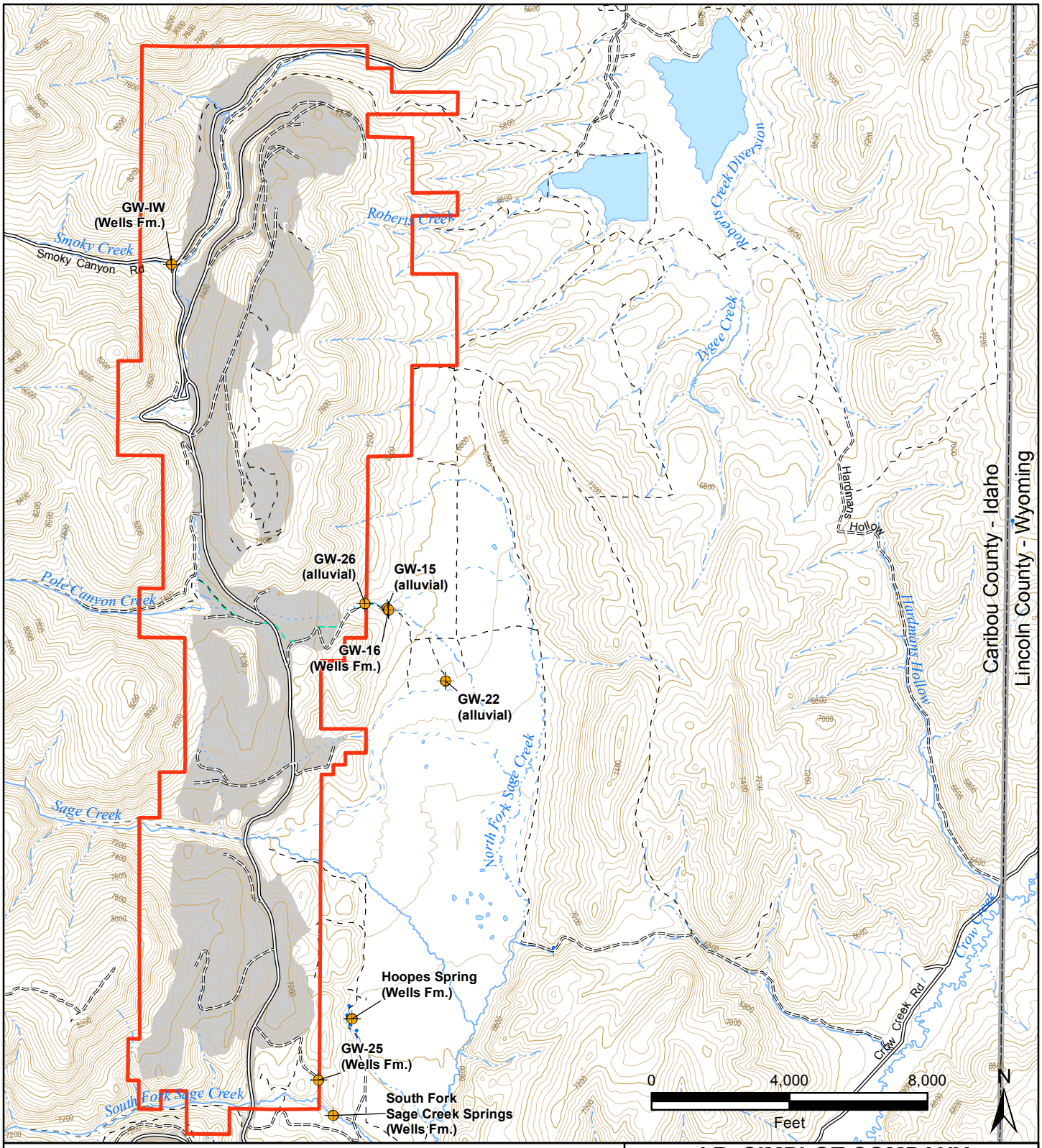

Legend

- Groundwater Monitoring Locations Exceeding Selenium MCL (0.05 mg/L)
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Perennial Stream
- Intermittent Stream
- Canal Ditch
- Historic Flow Path
- Pipeline
- Index Contour (200 ft)
- Intermediate Contour (40 ft)
- Lake/Pond
- Mine Disturbance Area
- Lease Area

MCL = Maximum Contaminant Level (0.05 mg/L)

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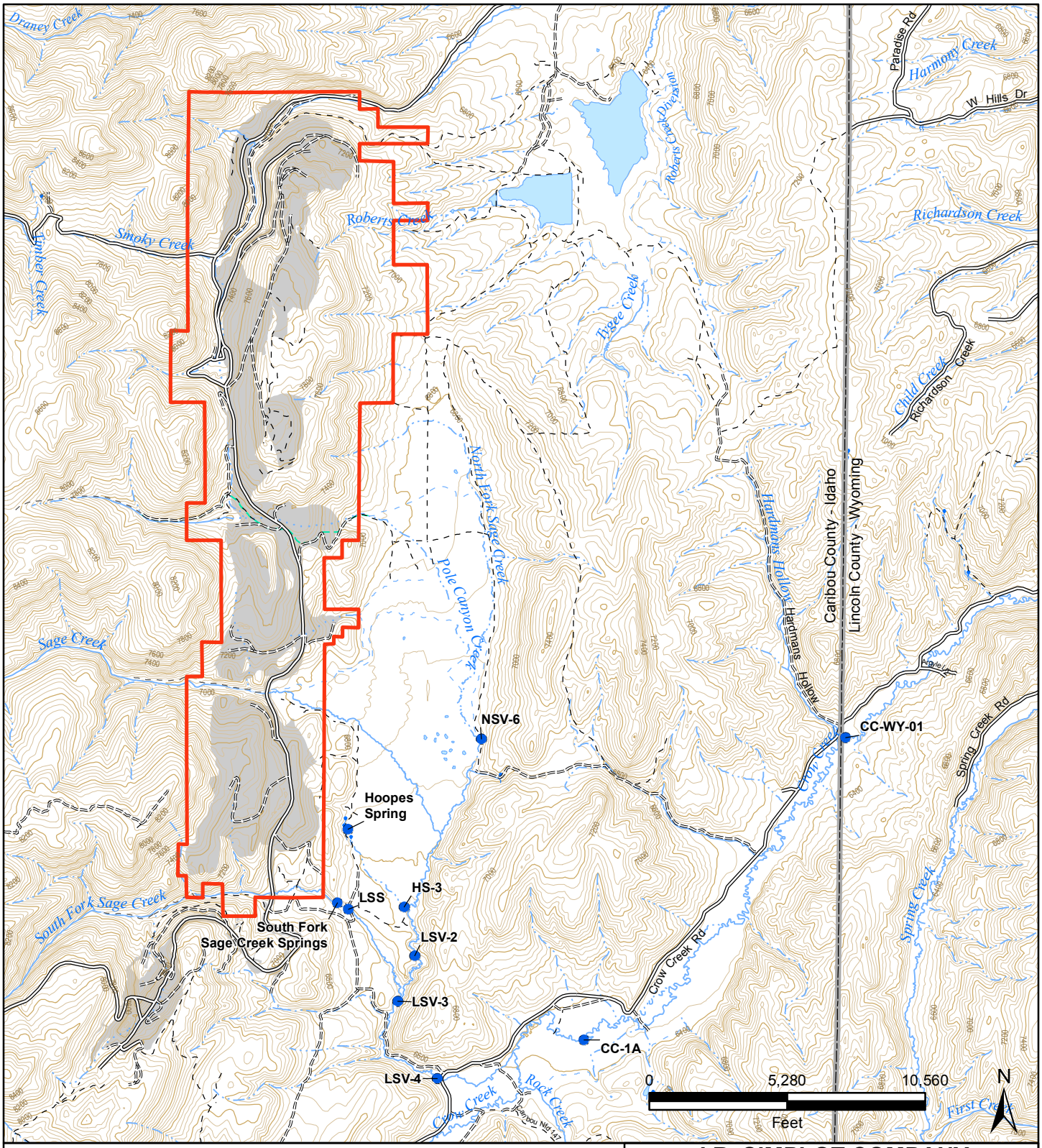
SMOKY CANYON MINE RI/FS
FEASIBILITY STUDY TECH MEMO #1

FIGURE 3-1

EXCEEDANCES OF SELENIUM MCL IN GROUNDWATER

DATE: MAY 2016	FORMATION ENVIRONMENTAL
BY: CRL	FOR: ACK

S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig3_01_Se_MCL_GW.mxd



Legend

- Surface Water Monitoring Locations Exceeding State of Idaho Surface Water Quality (Selenium) Criteria for Aquatic Life (0.005 mg/L)
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Perennial Stream
- Intermittent Stream
- Canal Ditch
- Historic Flow Path
- Pipeline
- Index Contour (200 ft)
- Intermediate Contour (40 ft)
- Lake/Pond
- Mine Disturbance Area
- Lease Area

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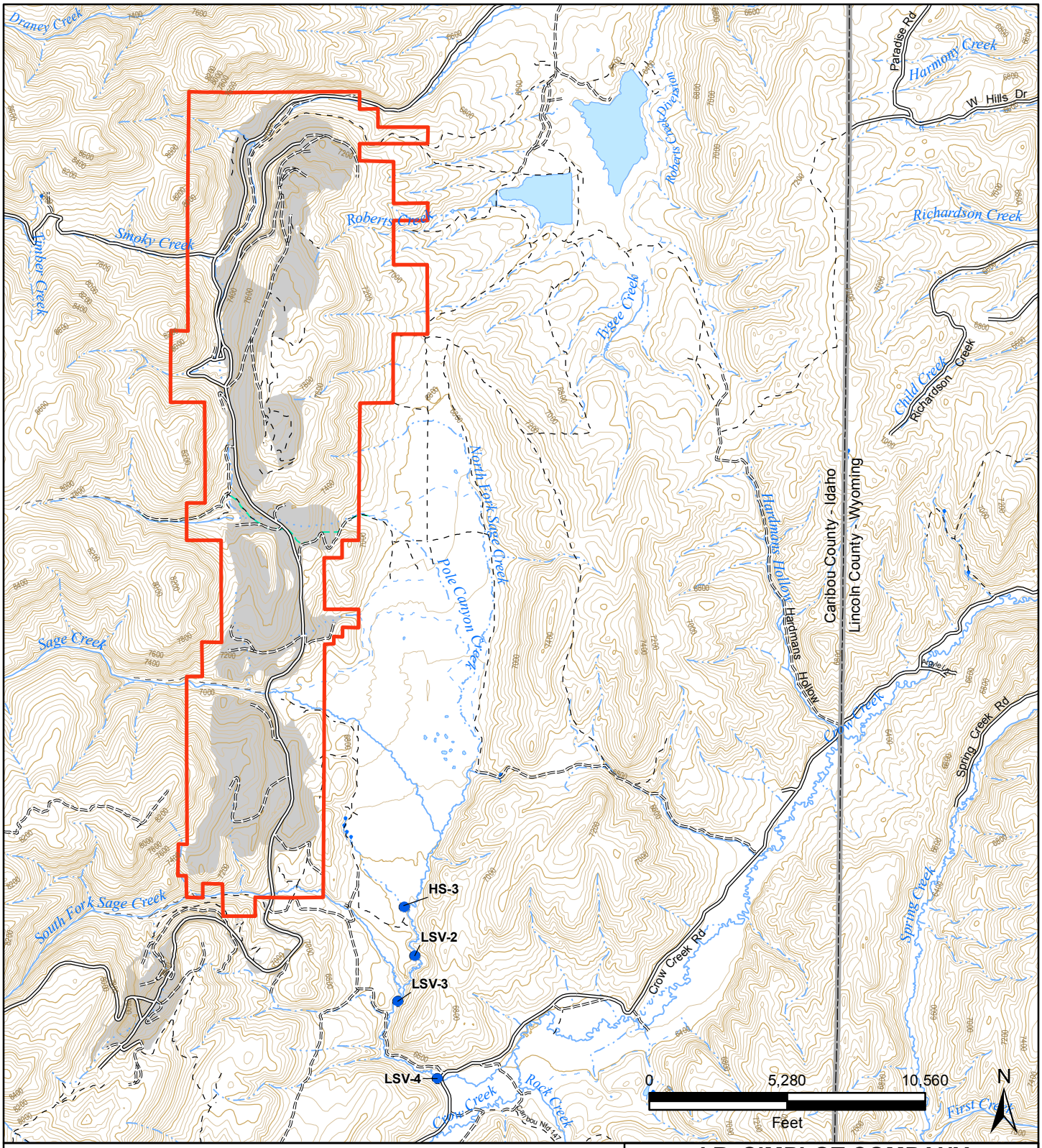
FIGURE 3-2

EXCEEDANCES OF SELENIUM CRITERION IN SURFACE WATER

DATE: MAY 2016	FORMATION ENVIRONMENTAL
BY: CRL	FOR: ACK

S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig3_02_Se_MCL_SW.mxd



Legend

- Surface Water Monitoring Locations with Elevated Selenium Risk to Aquatic Biota (Whole Body Tissue > 14.14 mg/kg dry weight)
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Perennial Stream
- Intemittent Stream
- Canal Ditch
- Historic Flow Path
- Pipeline
- Index Contour (200 ft)
- Intermediate Contour (40 ft)
- Lake/Pond
- Mine Disturbance Area
- Lease Area

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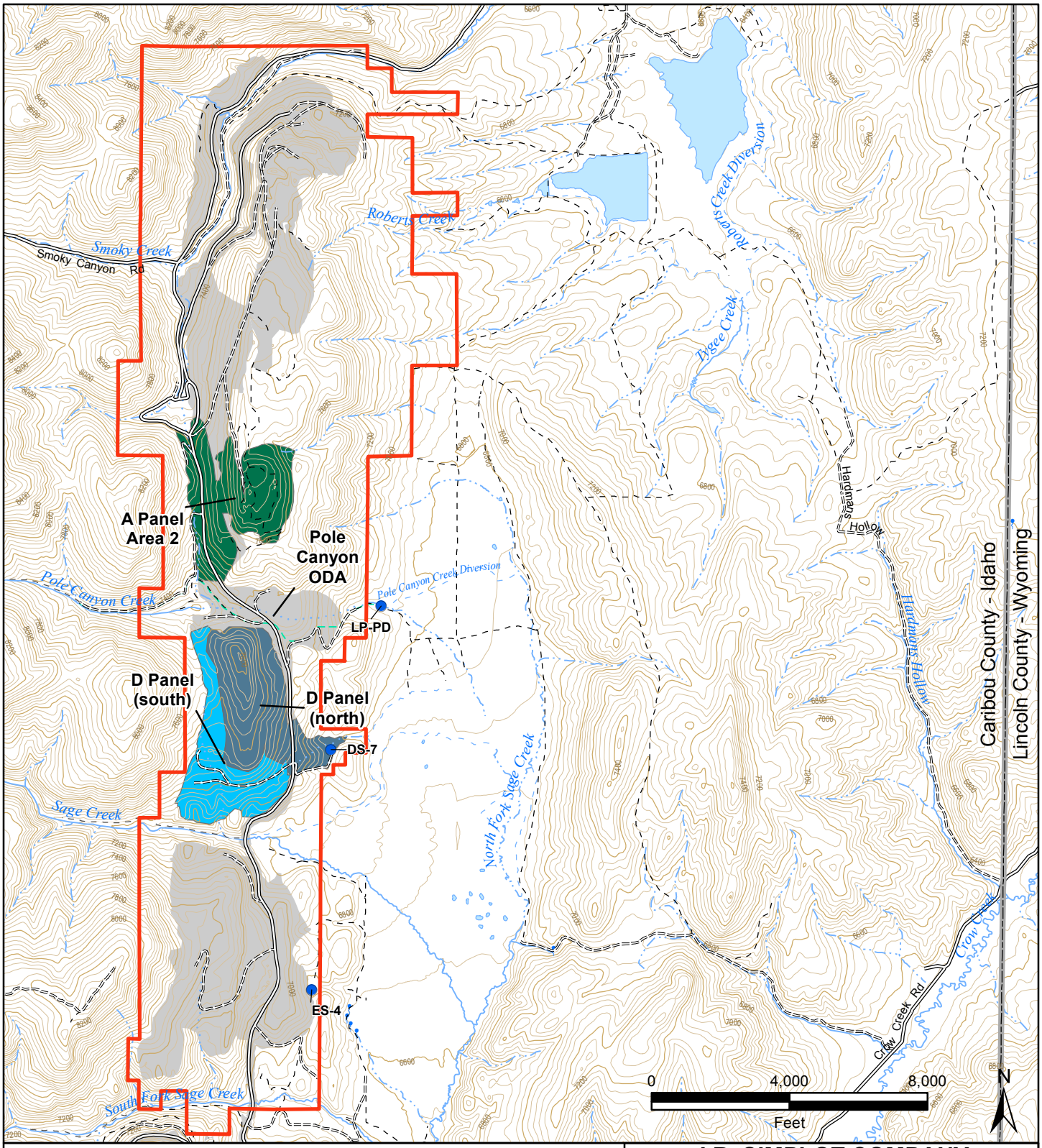
FIGURE 3-3

ELEVATED SELENIUM RISK TO AQUATIC BIOTA (WHOLE BODY FISH TISSUE)

DATE: MAY 2016
BY: CRL
FOR: ACK

FORMATION ENVIRONMENTAL

S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig3_03_Se_AqBiota_WholeBodyTiss.mxd



Legend

- Monitoring Locations with Elevated Selenium Risk
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Perennial Stream
- Intermittent Stream
- Canal Ditch
- Historic Flow Path
- Pipeline
- Lease Area
- Lake/Pond
- Mine Disturbance Area

Sampling Areas with Elevated Selenium Risk

- Panel A (Area 2)
- Panel D (north)
- Panel D (south)

Note: Selenium risk to terrestrial biota on the Pole Canyon ODA has been eliminated as a result of the Pole Canyon ODA NTCRA cover constructed in 2015.

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FEASIBILITY STUDY TECH MEMO #1

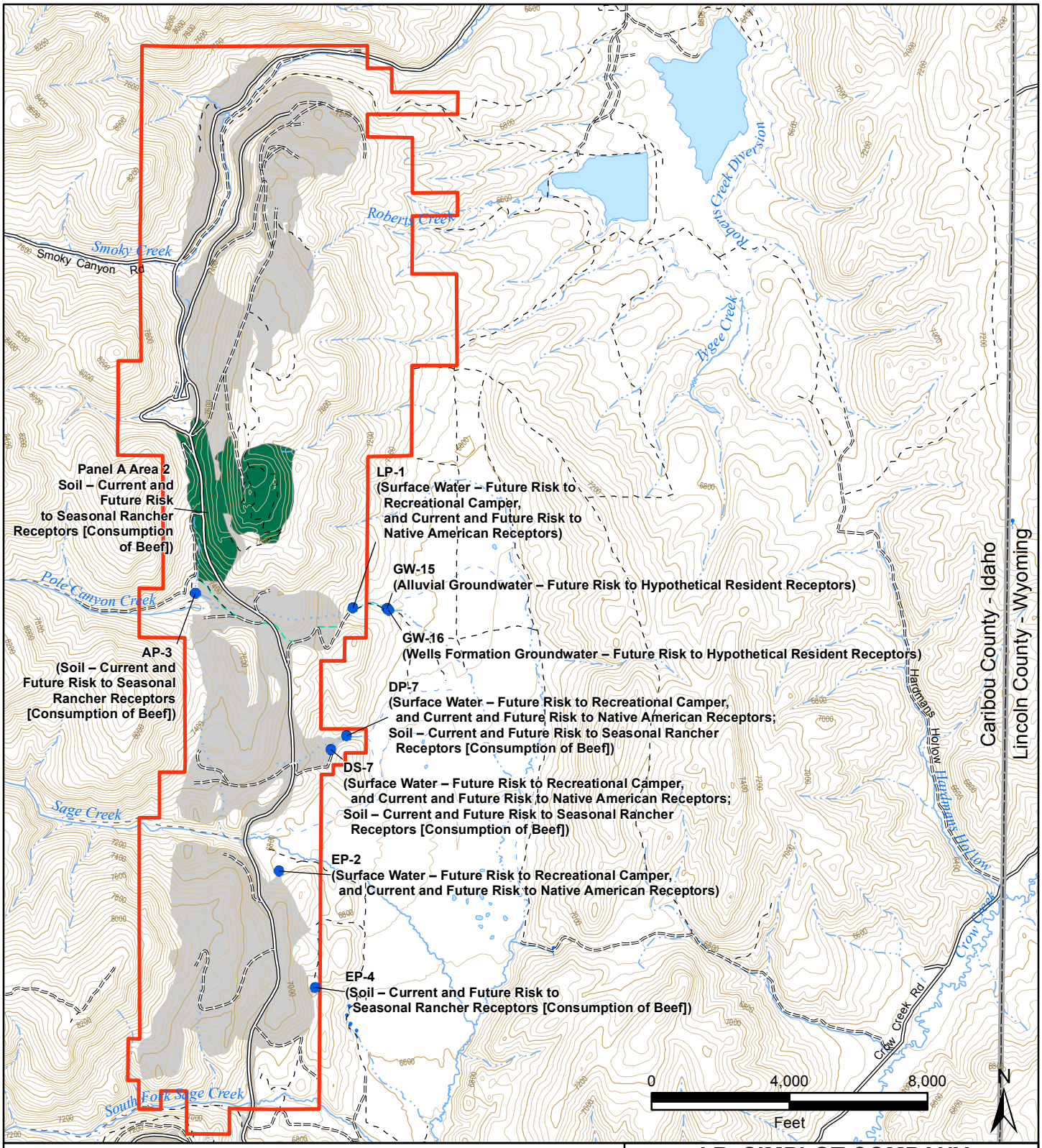
FIGURE 3-4

ELEVATED SELENIUM RISK TO TERRESTRIAL BIOTA FROM SOIL AND BIOTIC MEDIA

DATE: MAY 2016	
BY: CRL	FOR: ACK

FORMATION ENVIRONMENTAL

S:\GIS\arcprj\20101109\plt\FS\TechMemo1\Fig3_4_Se_TerrBiota_SL_VG.mxd



Legend

- Monitoring Locations with Elevated Arsenic Risk
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Index Contour (200 ft)
- Intermediate Contour (40 ft)
- Perennial Stream
- Intemittent Stream
- Canal Ditch
- Historic Flow Path
- Pipeline
- Lease Area
- Lake/Pond
- Mine Disturbance Area

Sampling Area with Elevated Arsenic Risk

- Panel A (Area 2)

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FEASIBILITY STUDY TECH MEMO #1

FIGURE 3-5

ELEVATED ARSENIC RISK TO HUMAN RECEPTORS

DATE: MAY 2016		FORMATION ENVIRONMENTAL
BY: CRL	FOR: ACK	

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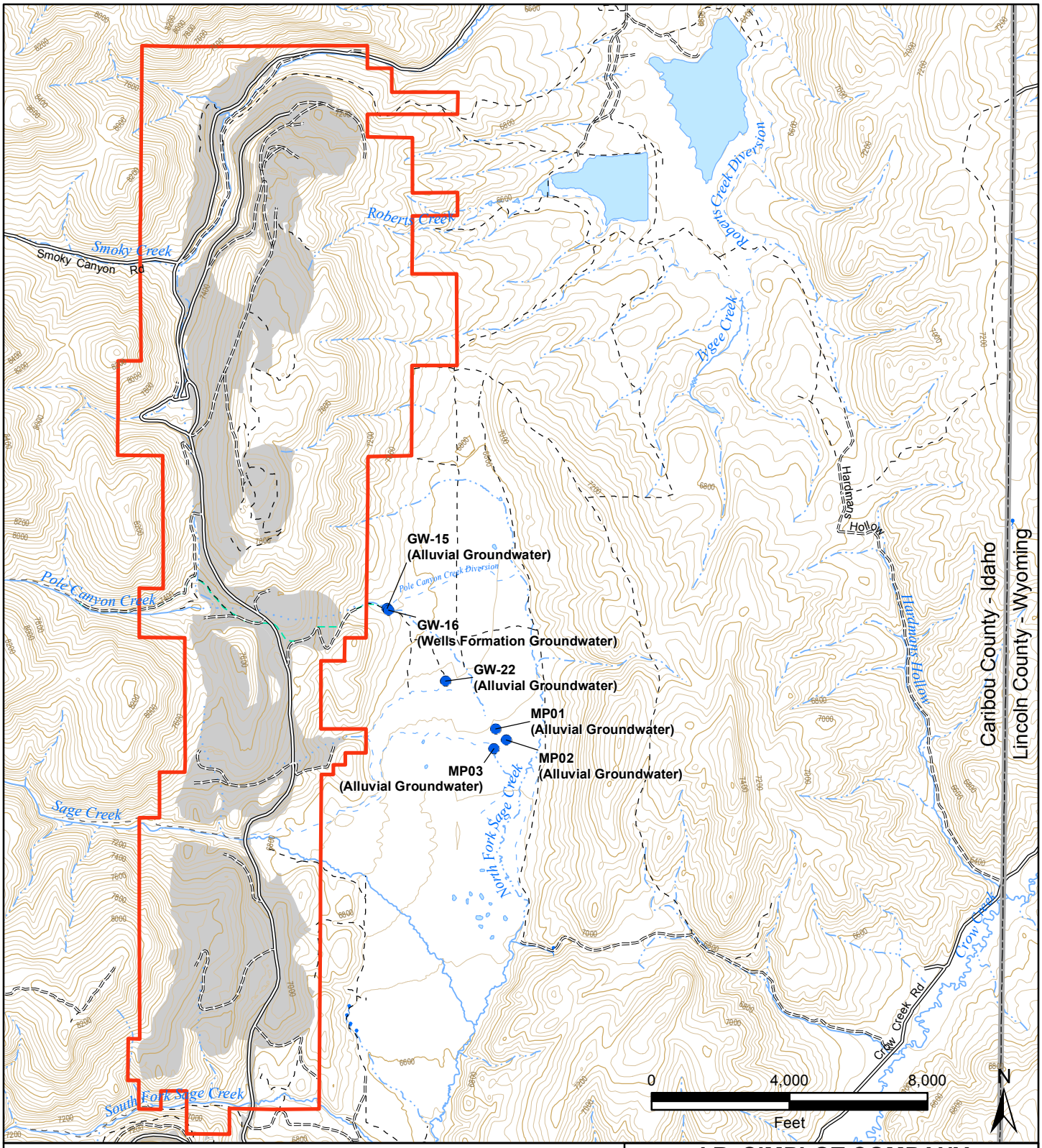

Legend

- Monitoring Locations with Future Elevated Selenium Risk
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Index Contour (200 ft)
- Intermediate Contour (40 ft)
- Perennial Stream
- Intemittent Stream
- Canal Ditch
- Historic Flow Path
- Pipeline
- Lake/Pond
- Mine Disturbance Area
- Lease Area

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SMOKY CANYON MINE RI/FS
FEASIBILITY STUDY TECH MEMO #1

FIGURE 3-6

FUTURE ELEVATED SELENIUM DRINKING WATER RISK TO HYPOTHETICAL RESIDENT HUMAN RECEPTORS

DATE: MAY 2016
BY: CRL
FOR: ACK

FORMATION ENVIRONMENTAL

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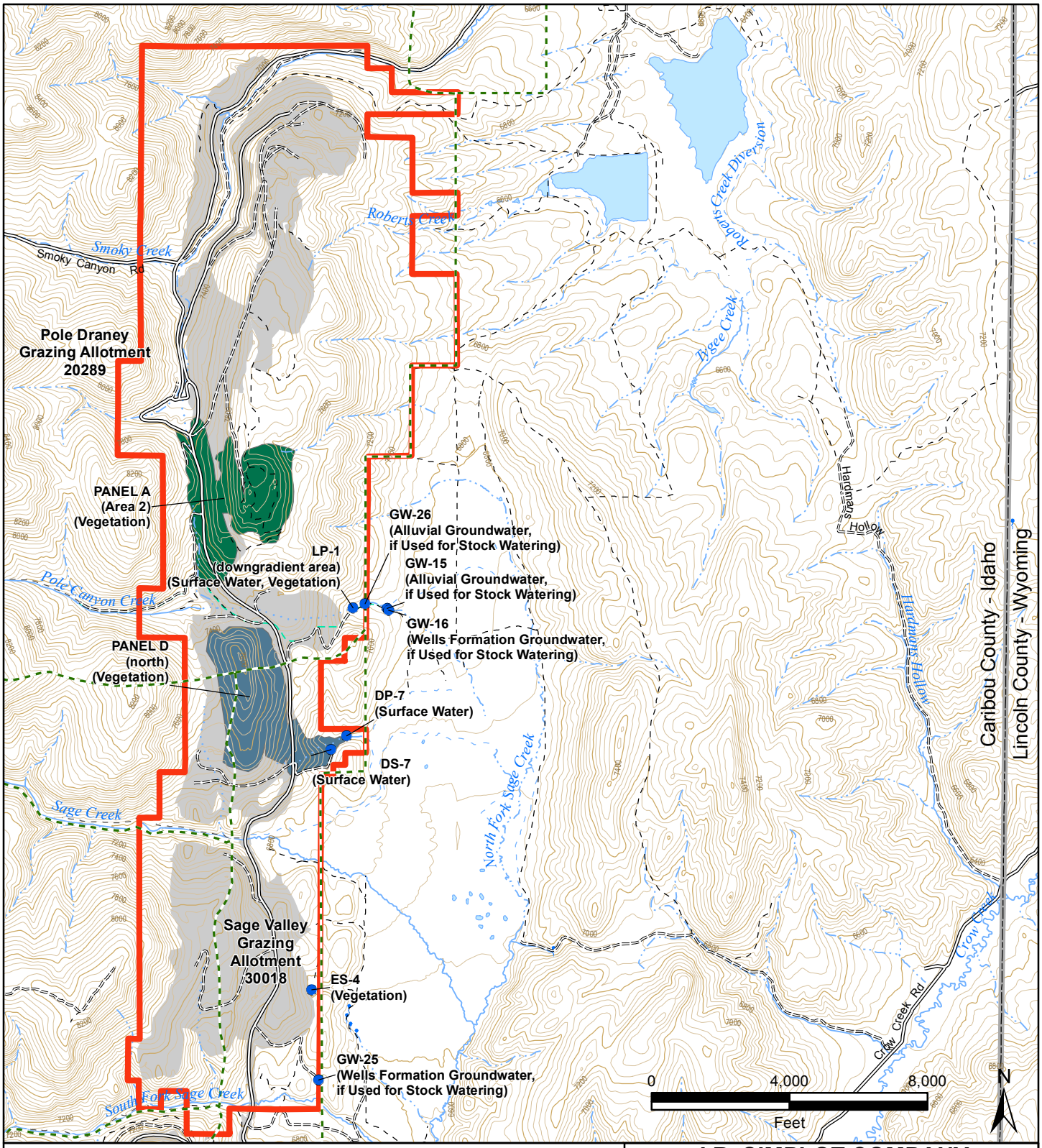

Legend

- Monitoring Locations with Future Acute Selenium Risk
- Minor Road
- Unimproved Road
- Trail (4WD)
- Trail (Other than 4WD)
- Index Contour (200 ft)
- Intermediate Contour (40 ft)
- Perennial Stream
- Intemittent Stream
- Canal Ditch
- Historic Flow Path
- Pipeline
- Lake/Pond
- Mine Disturbance Area
- Grazing Allotment (USFS)
- Lease Area

Sampling Areas with Future Selenium Risk

- Panel A (Area 2)
- Panel D (north)

J.R. SIMPLOT COMPANY
SMOKY CANYON MINE RI/FS
FEASIBILITY STUDY TECH MEMO #1

FIGURE 3-7

FUTURE ACUTE SELENIUM RISK TO LIVESTOCK

DATE: MAY 2016
BY: CRL
FOR: ACK

FORMATION ENVIRONMENTAL

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FIGURE 4-1. IDENTIFICATION OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

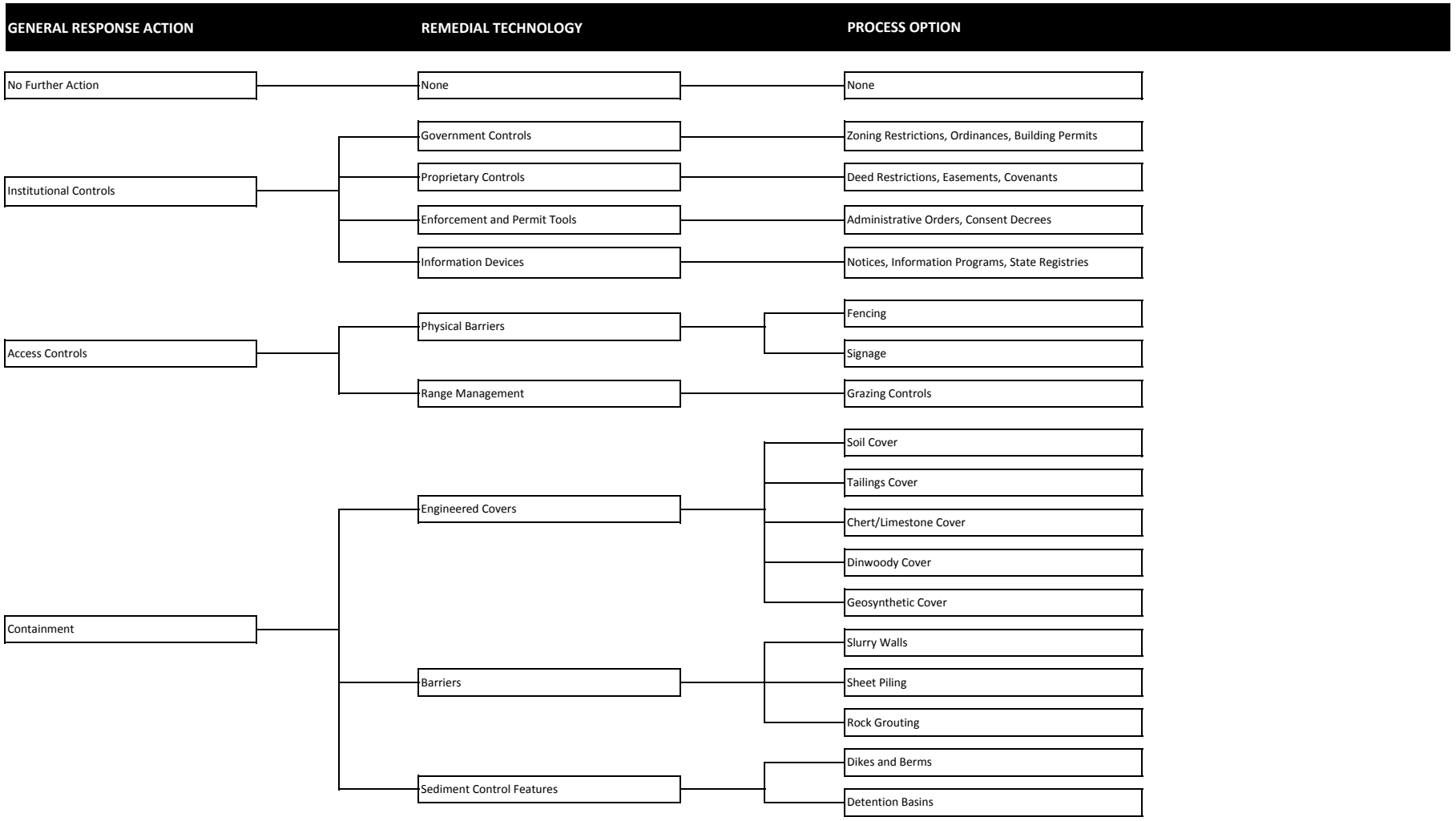
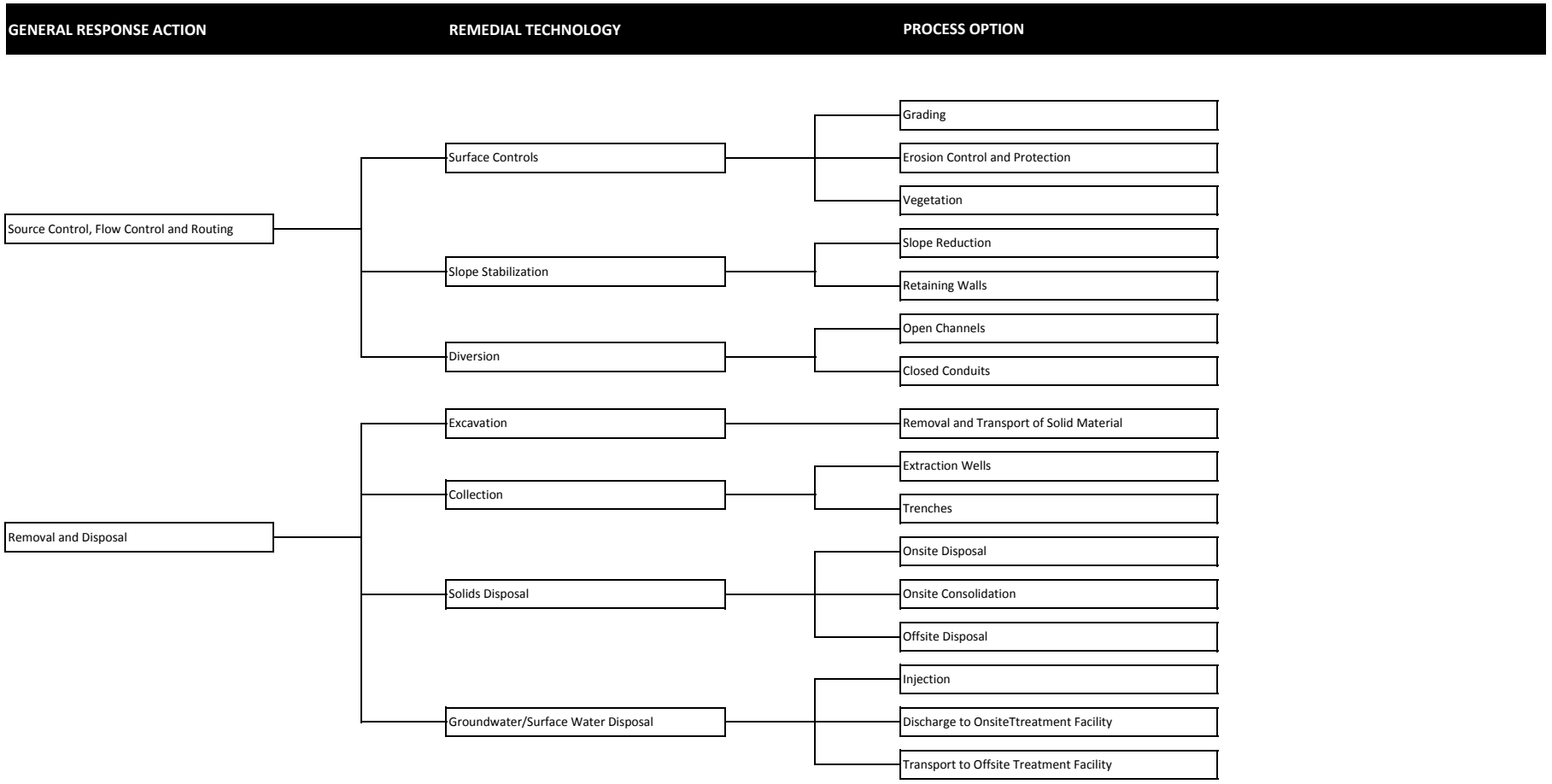


FIGURE 4-1. IDENTIFICATION OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS



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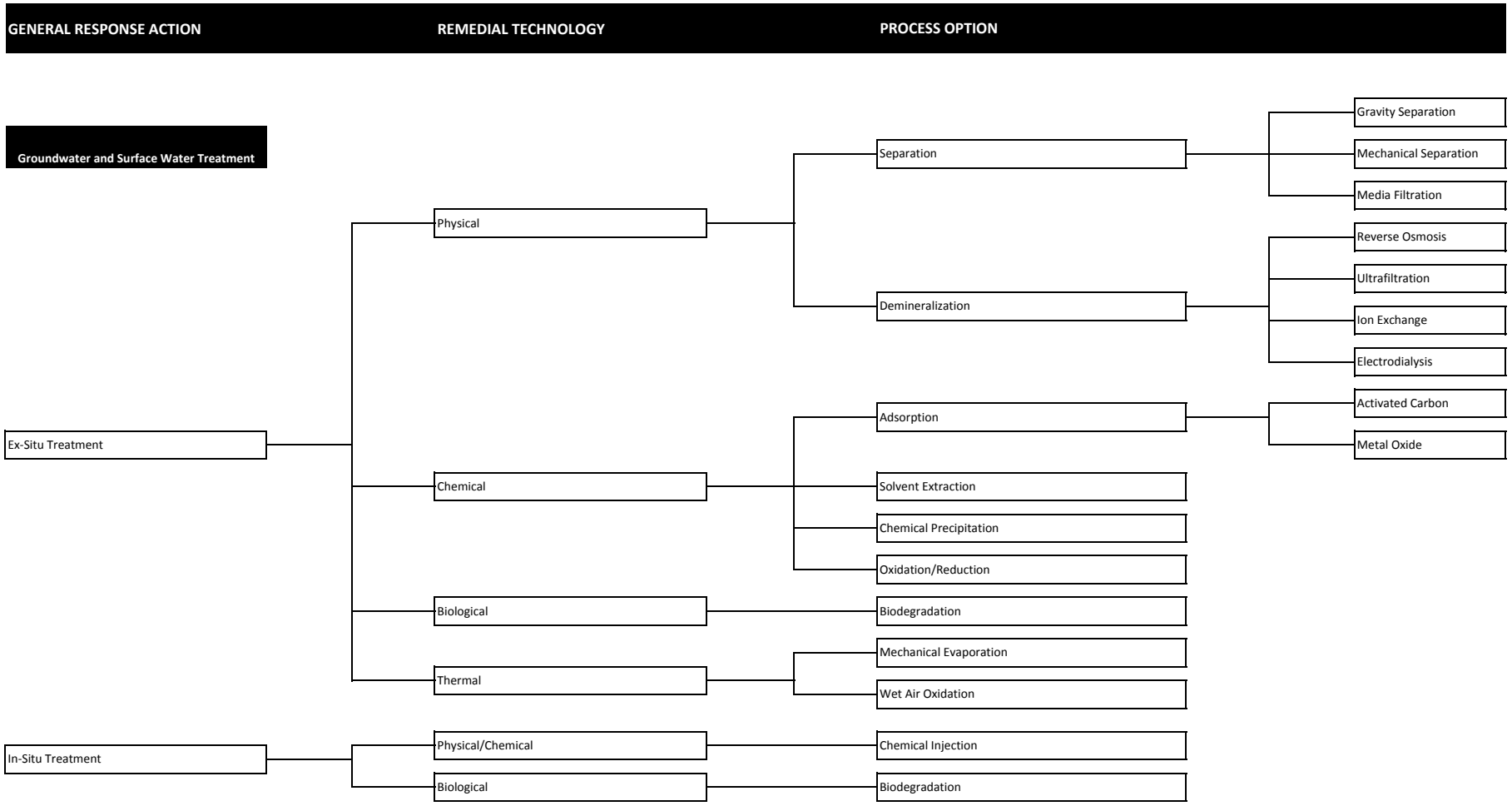


FIGURE 4-1. IDENTIFICATION OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

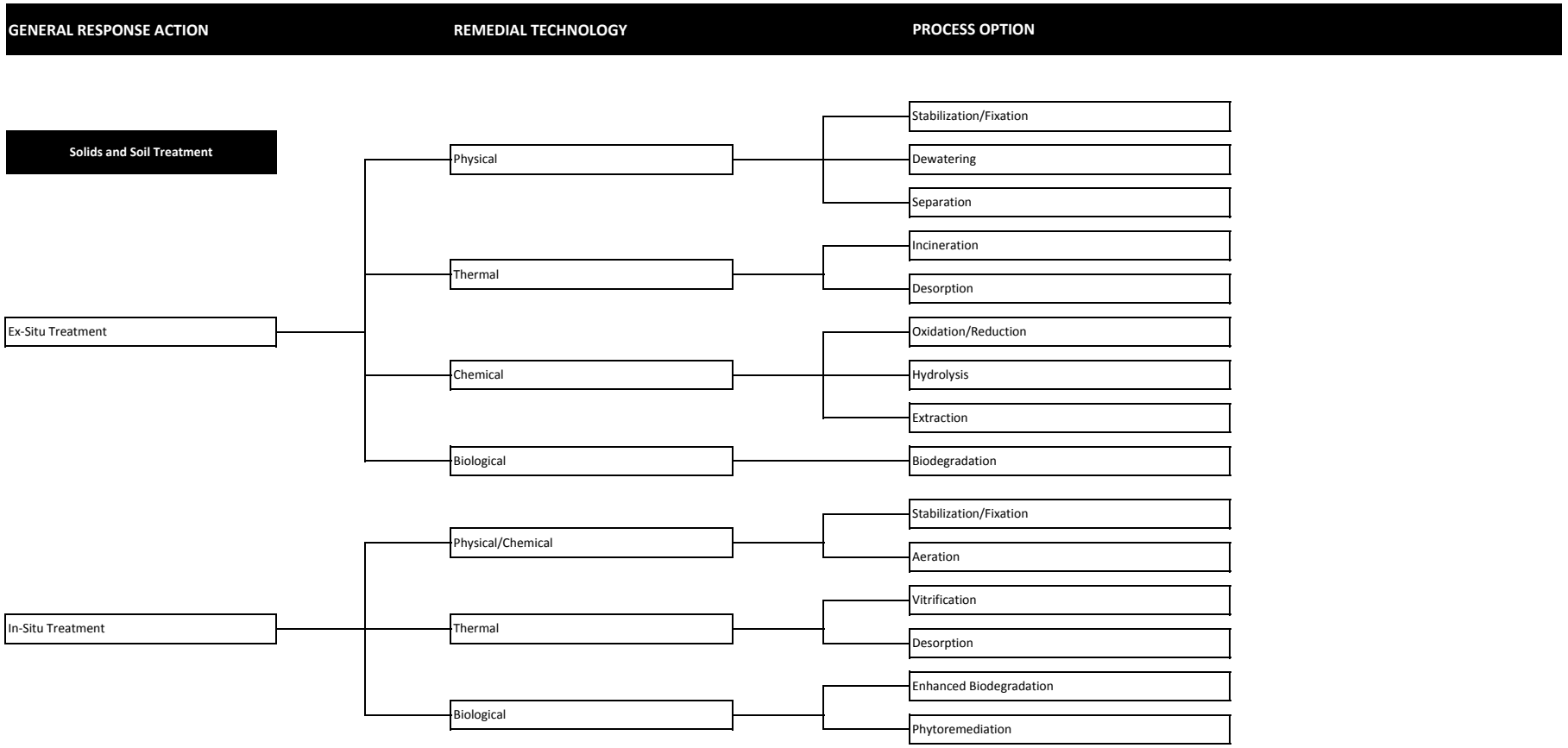


FIGURE 4-2. INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR IMPLEMENTABILITY

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	PROCESS OPTION	DESCRIPTION	SCREENING COMMENT
No Further Action	None	None		No further action.	Required by the NCP as a baseline for comparison.
Institutional Controls	Government Controls	Zoning Restrictions, Ordinances, Building Permits		State or county laws or regulations that restrict or control land or resource use.	Potentially implementable.
	Proprietary Controls	Deed Restrictions, Easements, Covenants		Deed restrictions prevent use of groundwater as drinking water and as stock tank water.	Potentially implementable.
	Enforcement and Permit Tools	Administrative Orders, Consent Decrees		Legal tools that limit ceratin activities or require the performance of specific activities.	Not implementable because agreements are not binding and would require enforcement.
	Information Devices	Notices, Information Programs, State Registries		Notification that residual or covered contamination remains at a site.	Potentially implementable.
Access Controls	Physical Barriers	Fencing		Fixed structures that function as boundaries or barriers.	Potentially implementable.
		Signage		Signs convey information on land use and use restrictions or warnings.	Potentially implementable.
	Range Management	Grazing Controls		Grazing controls limit the location, timing, and duration of livestock grazing.	Potentially implementable.
Containment	Engineered Covers	Soil Cover		Soil cover layer to limit infiltration, reduce seepage, and reduce uptake of selenium by plants.	Potentially implementable.
		Tailings Cover		Tailings cover layer to limit infiltration, reduce seepage, and reduce uptake of selenium by plants.	Potentially implementable.
		Chert/Limestone Cover		Chert/limestone layer to provide a capillary break and minimize burrowing and root growth.	Potentially implementable.
		Dinwoody Cover		Dinwoody cover layer to limit infiltration, reduce seepage, and reduce selenium uptake by plants.	Potentially implementable.
		Geosynthetic Cover		Clay and synthetic membrane (GCLL or GM) covered by soil to prevent infiltration and reduce seepage.	Potentially implementable.
	Barriers	Slurry Walls		Trench around ODAs or source materials filled with a soil bentonite slurry.	Not feasible because the Wells Formation aquifer is deep and highly fractured.
		Sheet Piling		Cutoff walls formed of wood, synthetics, pre-fabricated concrete, or steel.	Not feasible because the Wells Formation aquifer is deep and highly fractured.
		Rock Grouting		Pressure injection of grout in drilled holes or using vibrating beam method.	Not feasible because the Wells Formation aquifer is deep and highly fractured.
	Sediment Control Features	Dikes and Berms		Grading the land surface to control surface water runoff and sediment mobilization.	Potentially implementable.
		Detention Basins		Basins or ponds used to allow sediment to settle out of storm water runoff.	Potentially implementable.

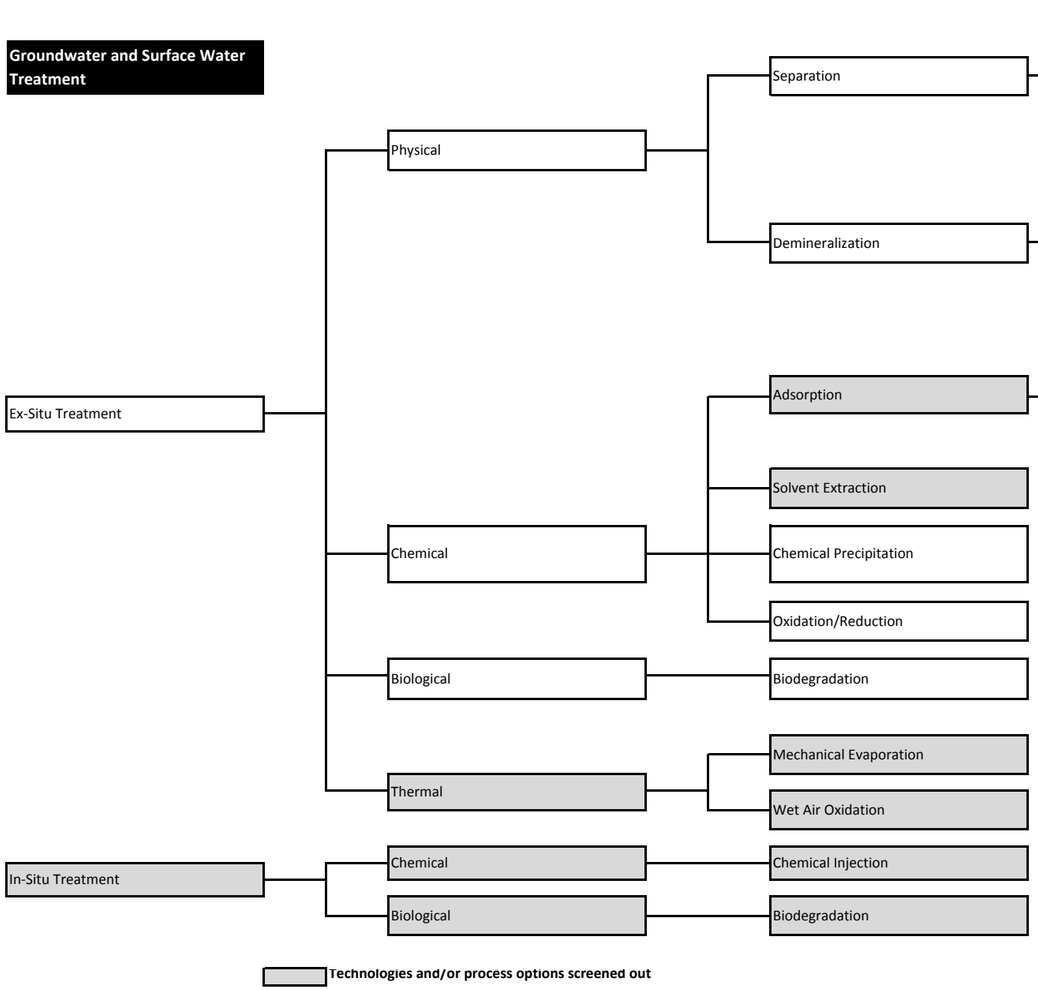
Technologies and/or process options screened out

FIGURE 4-2. INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR IMPLEMENTABILITY

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	PROCESS OPTION	DESCRIPTION	SCREENING COMMENT
Source Control, Flow Control and Routing	Surface Controls	Grading		Grading the land surface to manage surface water infiltration and runoff.	Potentially implementable in conjunction with source control and flow control technologies.
		Erosion Control and Protection		Use of riprap, vegetation, and geosynthetic fabrics to reduce erosion.	Potentially implementable.
		Vegetation		Application of soil and seeding with native plants to reduce infiltration, runoff, erosion.	Potentially implementable in conjunction with engineered covers.
	Slope Stabilization	Slope Reduction		Reducing the grade of surface slopes of backfilled pits and ODAs.	Potentially implementable.
		Retaining Walls		Vertical walls of steel, concrete, bricks, wood, or rock to stabilize steep slopes.	Potentially implementable.
	Diversion	Open Channels		Engineered canals or ditches constructed to convey surface water.	Potentially implementable.
		Closed Conduits		Culverts or pipes installed below ground to manage and control surface water.	Potentially implementable.
Removal and Disposal	Excavation	Removal and Transport of Solid Material		Excavation and transport of overburden/soils using earthmoving equipment.	Potentially implementable in conjunction with disposal technologies.
	Collection	Extraction Wells		Pumping well(s) used to extract contaminated groundwater.	Not feasible due to complex geology and preferential groundwater flow paths.
		Trenches		Excavated ditches or channels to intercept and manage surface water or groundwater.	Not feasible due to complex geology and preferential groundwater flow paths.
	Solids Disposal	Onsite Disposal		Identification of an onsite location for disposal of treatment residuals or overburden/soils.	Potentially implementable for small volumes of material such as treatment residuals.
		Onsite Consolidation		Consolidation and relocation of solids/soils or treatment residuals and disposal in mine pits.	Potentially implementable for small volumes of material such as treatment residuals.
		Offsite Disposal		Disposal of hazardous material in a landfill offsite.	Potentially implementable for hazardous materials such as treatment residuals.
	Groundwater/ Surface Water Disposal	Injection		Disposal of impacted water by injection into deep wells.	Not feasible because deep groundwater is discharged to the surface at springs.
		Discharge to Onsite Treatment Facility		Routing and discharge of impacted water to a treatment facility onsite.	Potentially implementable.
		Transport to Offsite Treatment Facility		Transport of impacted water to a publicly owned treatment works (POTW) facility offsite.	Not implementable because there are no POTW facilities near the Site.

Technologies and/or process options screened out

FIGURE 4-2. INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR IMPLEMENTABILITY



GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	PROCESS OPTION	DESCRIPTION	SCREENING COMMENT
Groundwater and Surface Water Treatment	Physical	Separation	Gravity Separation	Separation of solids from a liquid using settling tanks, basins or other devices.	Potentially implementable in conjunction with other treatment technologies.
			Mechanical Separation	Separation of solids from a liquid using a mechanical device such as a belt press.	Potentially implementable in conjunction with other treatment technologies.
			Media Filtration	Separation of solids from a liquid typically using a granular media filter.	Potentially implementable in conjunction with other treatment technologies.
		Demineralization	Reverse Osmosis/ Ultrafiltration	Physical treatment process in which pressurized water passes through a semipermeable membrane.	Potentially implementable.
			Ion Exchange	Cation or anion exchange resins used to remove ions from water.	Potentially implementable in conjunction with other treatment technologies.
			Electrodialysis	An electric field used as the driving force for separating a liquid across a membrane.	Not applicable to inorganic contaminants found in groundwater at the site.
Ex-Situ Treatment	Chemical	Adsorption	Activated Carbon	Granular media filled vessels used to remove organics from groundwater, surface water and air.	Not applicable to inorganic contaminants found in groundwater at the site.
			Metal Oxide	Vessels filled with zero-valent iron or activated alumina used primarily to remove arsenic.	Site-specific pilot studies indicate this technology is not effective for selenium.
		Solvent Extraction		Separates constituents from a liquid by contact with another immiscible liquid.	Not applicable to inorganic contaminants found in groundwater at the site.
		Chemical Precipitation		Chemical process where dissolved ions/salts are precipitated in the form of insoluble salts.	Potentially implementable in conjunction with other treatment technologies.
		Oxidation/Reduction		Chemical reactions used to change contaminants to less toxic compounds.	Potentially implementable in conjunction with other treatment technologies.
	Biological	Biodegradation		Microorganisms used to degrade or reduce contaminants.	Potentially implementable.
	Thermal	Mechanical Evaporation		Water is mechanically heated to boiling and clean water is distilled off.	Not feasible because overburden volumes are too large.
		Wet Air Oxidation		Combustion reaction to break contaminated water and constituents down into base reaction products.	Not applicable to inorganic contaminants found in groundwater at the site.
In-Situ Treatment	Chemical	Chemical Injection		Chemical agents are injected into the impacted region of the aquifer to treat the groundwater.	Potentially hazardous byproducts, and complicated groundwater setting.
	Biological	Biodegradation		Nutrients are injected into groundwater to encourage native microorganisms to metabolize contaminants.	Not applicable to inorganic contaminants found in groundwater at the Site.

FIGURE 4-2. INITIAL SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR IMPLEMENTABILITY

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	PROCESS OPTION	DESCRIPTION	SCREENING COMMENT
Solids and Soil Treatment					
Ex-Situ Treatment	Physical		Stabilization/Fixation	Excavated solids slurried with stabilization/ fixation agents to reduce contaminant solubility and mobility.	Potentially hazardous byproducts. Not feasible because overburden volumes are too large.
			Dewatering	Separation of liquids from solids by various methods.	Not applicable for large volumes of overburden material.
			Separation	Soils are slurried, and passed through a gravity separation process to extract inorganics.	Site conditions not ideal for this technology.
	Thermal		Incineration	Energy applied to solids to combust organic constituents.	Not applicable to inorganic contaminants found in groundwater at the site.
			Desorption	Volatile compounds are separated or recovered from a solid or liquid matrix.	Not applicable to inorganic contaminants found in groundwater at the site.
	Chemical		Oxidation/Reduction	Chemical reactions used to change contaminants to less toxic compounds.	Not feasible because overburden volumes are too large.
			Hydrolysis	Contaminants react with hydrolyzing agents resulting in decomposition of the chemical compounds.	Potentially hazardous byproducts.
			Extraction	Multistage, intense scrubbing circuit used to wash and separate contaminated solids.	Not applicable to inorganic contaminants found in groundwater at the site.
In-Situ Treatment	Physical/Chemical		Stabilization/Fixation	Machinery is used to directly inject stabilizing agents, such as cement, into the soil.	Potentially hazardous byproducts.
			Aeration	Aeration of soils is typically achieved by soil vapor extraction systems.	Not applicable to inorganic contaminants found in groundwater at the site.
	Thermal		Vitrification	Soils are electrically heated and fused into a stable, glass-like block.	Not feasible because overburden volumes are too large.
			Desorption	Volatile compounds are separated or recovered from a solid or liquid matrix.	Not applicable to inorganic contaminants found in groundwater at the site.
	Biological		Enhanced Biodegradation	Nutrients are injected into soils to encourage native microorganisms to metabolize contaminants.	Not applicable to inorganic contaminants found in groundwater at the site.
			Phytoremediation	Plants are used to extract and concentrate some organic constituents and metals/metalloids from soils.	Not applicable due to the presence of plant eating livestock and wildlife at the site.

Technologies and/or process options screened out

FIGURE 4-3. EVALUATION OF PROCESS OPTIONS FOR EFFECTIVENESS, IMPLEMENTABILITY, AND RELATIVE COST

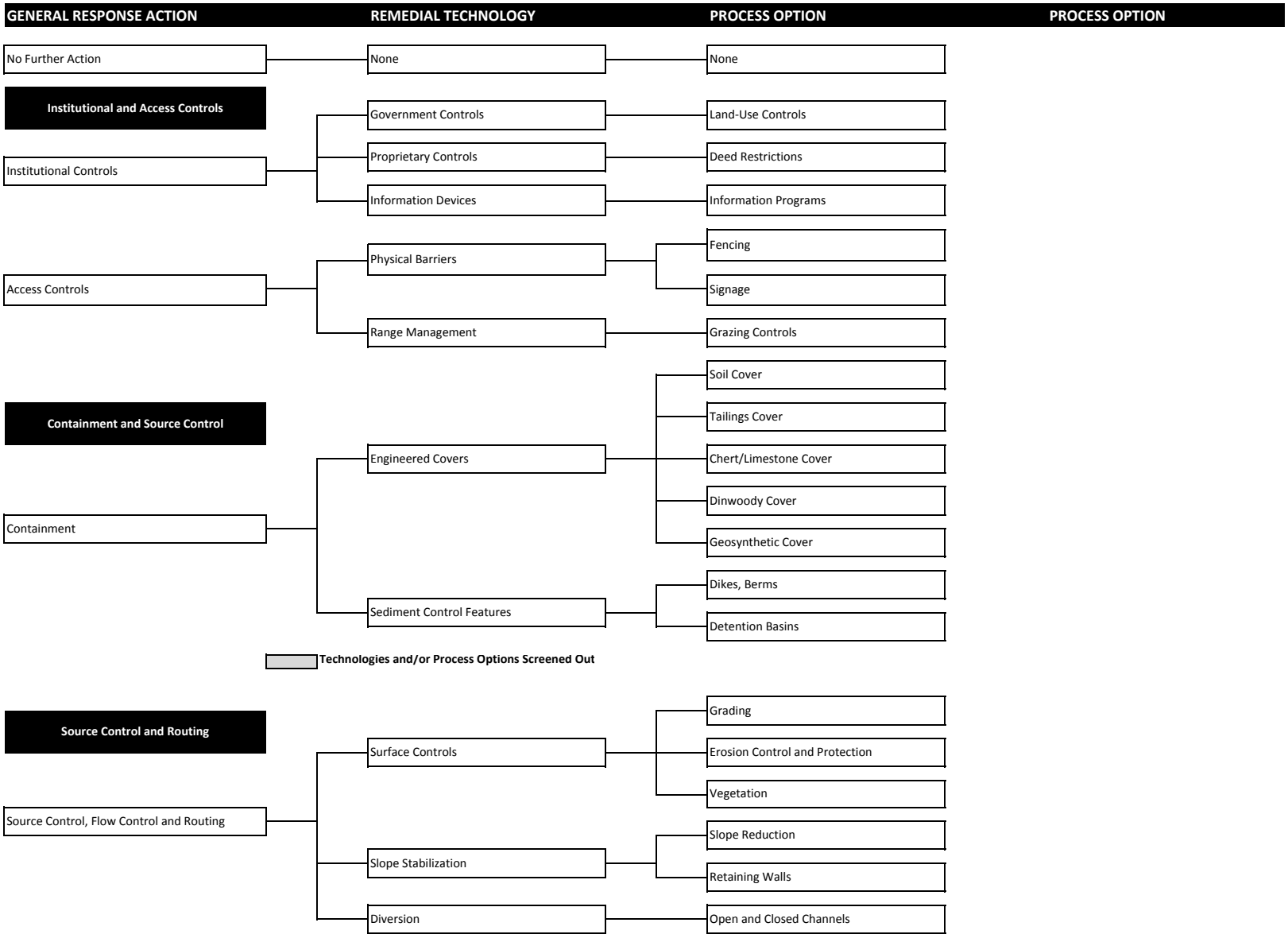


FIGURE 4-3. EVALUATION OF PROCESS OPTIONS FOR EFFECTIVENESS, IMPLEMENTABILITY, AND RELATIVE COST